113168
DEC 16 1881
SMITHSONIAN DEPOSIT

THE AMERICAN GAS LIGHT JOURNAL

BLOMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XXXIV.—No. 1. Whole No. 517. | NEW YORK, MONDAY, JANUARY 3, 1881. | $3 PER ANNUM IN ADVANCE.

A. M. CALLENDER & CO., Proprietors.
G. WARREN DRESSER, C.E., Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND CLASS MATTER.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European Countries, $3.50 (15 shillings—18 francs). All payments to be made in advance. Single copies, 15 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers Street, New York, are agents for this Journal. Newsdealers will send orders to them.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Correspondence.—Wishing to make this Journal a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of these subjects a pleasure or a profession.

CONTENTS.

☞ An asterisk (*) denotes an illustrated article

EDITORIALS—

Eighteen Eighty-One..... 1
Progress of Electric Lighting..... 1
The Western Gas Association's Spring Meeting..... 2
New Welding Process..... 2
The Eighth Annual Meeting of the American Gas Light Association. 3
Sanitary Survey of Baltimore..... 12
Nature's Big Gas Tanks..... 12
Contract for Street Lighting in 23d and 24th Wards of New York City..... 12
Cementing Labels to Metal..... 12
Reduction in Price of Gas..... 13
Accidents from Gas..... 13
An American Chandelier at Sydney..... 13
Danger from Electric Lighting..... 13

CORRESPONDENCE—

Gas on an Illuminating Basis..... 13

EIGHTEEN EIGHTY-ONE.

Truly, the year 1880 may be said to have left us in the brightness of returned prosperity. On every hand the signs of healthy activity are apparent, and we begin the new year with the brightest prospects for the year to come. This is especially true in our own industry, which is ever the sensitive barometer that indicates the condition of trade, manufactures and general business with that unerring accuracy which can only be obtained by the application of an index so truthful and accurate as "the little piece of mechanism" which registers every man's consumption of gas.

From every side we hear the cheering news—"Our send-out is larger than last year," while, in a few instances, it is a fact that more gas has been sold than ever before. During the year past there have been one or two important advances made in our own land in the mechanical appliances for the manufacture of coal gas, the most important of which are the successful application of the improved furnaces in a number of places, and the practical success of the mechanical stoker at Cincinnati. By both of these improvements is there not only a saving in the first cost of manufacture, but humanity is benefited by the release of the stoker from the most arduous of the labor connected with retort house work, viz., the clinkering of fires, and the drawing of hot coke from the benches by manual labor. The standard of purity in coal gas may be said to be constantly improving, as more care is devoted to condensation and purification, while it is believed that there has been a uniform improvement in illuminating power, accompanied by a yield that was largely in excess of what was obtained a few years ago. The judicious mixtures of coals in the larger works, and a more constant watchfulness over the minor details of the retort house, have conduced greatly to this latter result. For many of these minor improvements there is no doubt that the cause may be found directly in the meetings of the various associations of gas engineers which are held throughout the country, whose proceedings in full have been laid before our readers in the verbatim reports published in this Journal.

If we have been the vehicle for the transmission of useful information to the gas maker, even in a slight degree, we must ever acknowledge that it is for thif purpose that we exist as a GAS LIGHT JOURNAL. It is not for the purpose of informing the gas world of what little we ourselves know; but to convey from all to each of the fraternity the free and honest expression of facts obtained in the daily practice of their profession so that each may benefit by the experience of others. In gathering from outside sources such information as we are able to obtain it is always our effort to give full credit to the source from which we derive our statements; and if we are unable to publish all that might be of interest to some of our readers, the fact must be borne in mind that our space is limited. To those who have contributed directly or indirectly towards making the Journal what it is we return our sincerest thanks, and not the least among these are our friends whose names appear in our advertising columns. It is a fact which we fully appreciate that our efforts would be in vain, were it not for their aid, and, while we believe and trust that they get full value received for the space they pay for by the permanent and direct attention their cards must attract by being regularly put into the hands of those whom they desire to reach, still it is with pleasure that we acknowledge our obligations to them. For the years to come we ask the continuance of the hearty co-operation of all interested in gas manufacture, and trust that we may ever be found sound, reliable, fair and unprejudiced. With renewed prosperity, with increased business, with improved processes and machinery, we wish a happy new year to you all.

PROGRESS OF ELECTRIC LIGHTING.

The close of the last year was marked by quite a brilliant demonstration in lighting by electricity. There are at least six different systems bidding for popular appreciation at the present time. Of these, two, viz., the Edison and the Maxim small lamps are on the incandescent principle, and of the others the Brush, Sawyer & Fuller, Jablochkoff, and the Maxim large lights are upon the principle of the voltaic arc, passing from one carbon point to another. At a number of places one or the other of these lights have been introduced for various purposes, some for practical use in lighting, others for advertising or like attracting purposes. Of the Maxim incandescent lights we spoke one month ago, and there has been nothing especially new developed in their application. The carbon filaments appear to last quite well, but the light from them is not particularly attractive, diffusive or bril-

TP700
.A5

liant. They seem well-adapted for special localities such as the vaults of the Safe Deposit Company, in the Equitable building, where there are said to be about 150 of them burning, some of which have lasted two months.

The amount of power required to generate them is not stated; but the possibilities in this respect have been quite freely demonstrated, and the result in practice will not vary greatly from 100 candles per horse power of engine.

On one evening of week before last, December 20th, a special train conveyed a party composed principally of members of the city government, and representatives of the press, from New York to Menlo Park, where Mr. Edison exhibited quite a large number of his lights in operation. Everything is reported to have worked very well, the lights themselves were soft and mellow, resembling somewhat that of a good kerosene lamp, while the collation supplied was bountiful and excellent, and followed by some speech making. Two hundred and eighty-seven lights were in full operation on posts scattered about through the fields surrounding the shops of Mr. Edison. The number of horse power of engine employed was said to be 42, or 6.8 lamps per horse power. The illuminating power was said to be "16 candles," but as there was no means of testing this, the exact illuminating power of each lamp could not have been determined; but if they were of 16 candle power the result would be but 108 candles per horse power of engine. The carbon loop has been somewhat lengthened so as to present more surface, and the form of the glass bulb is elongated to correspond with the loop. The usual lighting and extinguishing, by deflecting the current, was shown, and many pleasant expressions indulged in as to the future possibilities of the light. It is expected that the lamps will not last over six months when they are to be replaced by others. The occasion was a very enjoyable one to those who were there; and, as a sequel to it, a proposition was introduced into the Board of Aldermen on the following day to authorize Mr. Edison to apply his system of lighting wherever it may be desired in the part of the city bounded by Spruce, Wall and Nassau streets and the East river.

The right to lay the wires under the streets is asked for one year, and the application was referred to the Corporation Counsel. It is beyond the power of the Department of Public Works to give a guarantee that the experiment may continue for a year, as such a permission amounts to a franchise for the year, and requires the action of the Board of Aldermen. It is proposed to supply power in the daytime and light when needed. The experiment will be an exceedingly interesting one, if carried out, and it is to be most earnestly hoped that there will be no mixing of accounts, and that the public may be able to find out exactly what the economy is and where it comes from. As it stands to-day we know what it costs for a horse power in a gas engine, and also in a steam engine within tolerably accurate limits; and it appears that the 25 or so feet of gas burned in the engine ought, if burned in proper burners, to give at least 100 candles of light and be fully as cheap as it would be after its energy had been worked up, absorbed and somewhat diminished by converting it into electric force, and again transforming that force into heat, and thereby making a light from a piece of incandescent carbon about the size of a coarse horsehair.

While the Aldermen were enjoying the supper, wines and segars at Menlo Park, there was another demonstration going on in Broadway, from 14th to 26th streets, open to all, and, as far as we have heard, no lunch, and those who enjoyed the sight could look on without listening to aldermanic speeches, and could smoke their own cigars—if they happened to have any. A station with ample engine power for running several dynamo machines is established at 133 West 25th street (about 1200 feet from Madison Square), from thence a line of insulated copper wire extends to Madison Square, then down Broadway to 14th street and returns to the central station, making a circuit of a little less than two miles in length. Upon this were placed 16 lamps, one being in front of the station and the other 15 being about 200 feet apart on Broadway. The lights burned with greater steadiness than is generally seen where these lights are in use. The power of the lights is stated at various figures, some of which are as high as several thousand candles, but they were probably about equal to 600 candles. The exhibition was a success, if we may be permitted to say so, in everthing but its lighting. The apparatus was evidently in perfect order, and everything worked remarkably well. The lights were steady, there being hardly any blinking to be noticed; but they were too far apart to give the flood of light in the street which the public naturally expected. The intensity of the light (like that of a magnificent planet) was undoubted, but its diffusive power was not sufficient to fill the radius of one hundred feet surrounding each post. Gas looked yellow, but it was not entirely overpowered. The 200-candle Sugg burner standing at the corner of Broadway and 5th avenue, at 23d street, lighted with the gas of the Municipal Company held its head high and was not abashed, and there was as much light under it within a radius of 25 feet as under the other, while it was, to many, of a much more agreeable character in itself. Undoubtedly, the electric lights added much to the brilliancy of the street, and the company having the matter in charge are entitled to great credit for their liberality and their thoroughness in this experiment to show just what the light may do. The whole affair was at the expense of the electric light company, and was gazed at by many people; but if the company were to undertake to light all and every one of our streets in this way it would probably add a far greater amount to the city expenses than it would subtract from the exchequer of the gas companies. The one fact is ever prominent, viz.: Electricity cannot be stored and ready for use when wanted. It must be generated at the time, and any one of a hundred possible occurrences that should interrupt for an instant the continuous flow of the current causes instant extinction of the light. The developments in the practical application of the electric light to purposes for which it is adopted during the past year certainly show progress, but that its sphere is a separate special one becomes more apparent as it is more extensively used. There is room for all; the darkness of this world cannot be all dispelled by gas and electricity combined. Each has its appointed work to do, and the duty of every one is to see that the one he is associated with is doing all it can for the comfort, improvement and good of mankind.

[Official Notice.]

The Western Gas Association's Spring Meeting.

The note of preparation for the next meeting of this Society, in May, 1881, has been sounded, and in no uncertain or halting manner. It is the call "forward," and there is no doubt but the ranks will be full, and each and every one will present himself well-equipped with "full and accurate figures and memoranda." The list of subjects suggested is a good one; and while any one is at liberty to select a topic outside of this list, still there is ample scope for enquiry within it, as it practically covers the whole art of gas making, and also the subject of the electric light. It is gratifying to see continued improvement in the methods of securing proper preparation for the meetings of the various associations devoted to the interests of gas making, and we give below the call from the President of the Western Association:

Western Gas Association, Office of President,
Rockford, Ills., Nov. 15, 1880.

Being, under our rules, required to present in my address to the Association, at its annual meeting, such subjects for discussion as may be deemed of interest, I have instructed the Secretary to embody the following subjects in circular form for your information, and earnestly request that you will prepare yourself to participate in their discussion either orally or by preparing a paper upon any or all of them.

It is of the utmost importance to a full and intelligent discussion of any subject, that full and accurate figures and memoranda should be kept and presented, as it is only by this course that we can render our proceedings valuable and instructive. It is not, however, intended that the official presentation of these subjects for discussion shall preclude any member of the Association from preparing any paper upon any other subject he may deem best. All such are welcome. Even the "widow's mite" had a value; and why should not we apply the same rule in making up our treasury of knowledge.

Thos. Butterworth, *President.*
Lee A. Hall, *Secretary.*

Subjects for discussion at Fourth Annual Meeting at St. Louis, Mo., May 11th, 12th and 13th, 1881.

1st.—"Heat." Its philosophy and economical use.

2d.—"Gas Furnaces." Are we making any practical advance? If not, what are the defects of the present system, and how shall they be remedied?

3d.—"Treatment of Gas after Leaving the Retort."—Relative distances between machinery, and effect of travel on the gas through same, from hydraulic main to station meter.

4th,—"Exhauster." Its proper location with condenser and scrubber.

5th.—"Coal Tar."—1st. How far is it profitable in the West to work it up beyond heavy oil and pitch?

2d. If so, what are the most practical methods of doing so, and what are the chances of a profitable market for the product?

6th.—"Electric Light." What, if any, advance has been made that will materially injure gas companies?

New Welding Process.—Krupp has recently taken out a German patent for a new process of welding tubes and tires. He draws the tube on a pair of ordinary rolls, and heats the whole length of the portions which are to be welded in a portable fire-box, into which air is blown, so that the heat is directed against the weld. After the necessary heat is obtained, the rolls are set in motion, and the plate which is to be welded is repeatedly drawn through them.

[Official Report.—Continued from page 252.]

Eighth Annual Meeting of the American Gas Light Association.

Held at Chicago, Ill., October 13, 14, and 15, 1880.

Afternoon Session.—October 14th.

The President—If that matter is disposed of, I would ask Dr. Love, who is present, to favor us with some remarks on burners. If he will please come forward, we will all be very glad to hear from him.

Dr. Love spoke as follows:

I regret that the duties of my position have prevented my completing the series of experiments which I had planned, and a short account of which I gave at your meeting last year. I have made certain experiments to determine what burners should be adopted in testing for illuminating power the gases in the city of New York. There the conditions are somewhat peculiar, and do not exist throughout the country.

Three years ago the photometric stations of the Department of Public Works were established, and the burner question received considerable attention. The contracts which the city made with the companies contained a clause—taken from English contracts—to the effect that the burner to be employed should be an argand of 15 holes, with a 7-inch chimney, by which burner the gas should give the light of 16 candles. The best burner corresponding with this specification was the Sugg-Letheby, and consequently it was used, although I stated that it was out of date, and earnestly recommended that a change be made. It has taken considerable time to bring about the change, as it was not effected until January last. The companies are now allowed to select such burners as they find best suited to their gas, provided it is within the reach of the consumer.

As the proposed change would show the gas to be of higher illuminating power by at least 2 candles, and so allow the companies to lower the quality by that amount, it was necessary either to raise the standard from 16 to 18 candles, and test by the improved burner, or to allow the companies to use the improved burners provided the illuminating power did not fall below the 16-candle standard as indicated by the Sugg-Letheby burner. As some companies preferred the latter plan, it was adopted.

The coal gas throughout the country will probably average from 14 to 16 candles, while the average illuminating power of the coal gas of New York is from 18 to 20 candles. I made a series of experiments with argand burners, having in mind the requirement that the burner adopted should be one that could be used by the consumer. For this reason I thought best to leave out the argands of foreign manufacture on account of their high price; and as the argands of American manufacture gave results little or no better than the flat-flame burners on this quality of gas, I decided that, on the whole, it would be better to adopt a flat-flame burner.

As I stated in the paper read at your last meeting, coal gas and naphtha gas should not be tested by the same burner, and as the flat-flame burner was decided on for coal gas, it seemed clear that the flat flame burner should with even greater reason be used for naphtha gas.

There are a great many flat-flame burners to be found in this country, a large proportion of which possess no specially redeeming feature. In regard to the flat-flame burners of foreign manufacture, there is one made by Mr. Bray, of Leeds, which, at about the time the question arose in New York, was attracting considerable attention, and with which I made a number of experiments. I learned that the burner was to be put in the American market, at a comparatively low cost, in the hope that it would replace burners of home manufacture.

A comparison of the Bray burners with the better burners of our own make showed, in the testing of coal gas, very little difference in the results; but with the naphtha gases the Bray burner proved somewhat superior. Before adopting a burner, I addressed a communication to the several gas companies of New York, giving the results of my experiments, and asking them if they wished to express any choice as to a burner. The Manhattan Company was the only one which offered any suggestions on the subject. They recommended a burner called the "Empire," which was being introduced by them for their consumers, and which corresponds with No. 4 or No. 5 of the Bray series. It is a brass burner with a screw check, and in the present instance was provided with a 5-foot tip. This burner is now used in testing the gas of the Manhattan and Harlem Companies.

The burner decided on for the naphtha gases was Bray's slit union No. 7, and, so far, I have had no reason to regret the choice. As to getting the maximum amount of light from that gas, I think this burner does it as satisfactorily as any I have seen.

The experiments of the past year have strengthened the opinion expressed, that no one burner can be adopted for the various illuminating gases made in this country. With a coal gas of from 14 to 16 or 17 candles, better results can be obtained by the use of some improved form of argand; but with the various gases involving the use of naphtha, there is great advantage in the use of the flat-flame burner.

The President—There is now no business before the Association. Mr. Page is to deliver a lecture this evening, but it is now but a few minutes after four o'clock. We have still nearly an hour that we might spend here.

Mr. Forstall—Mr. Goodwin has some statistics in regard to heating by gas, but he does not seem to be present.

The President—As there is no business now before us, and as Mr. Goodwin is not ready, we might give half an hour to Mr. Allen. (Applause.)

Mr. Allen—I do not known that I ought to accept, at this late hour, the very kind invitation that has been extended to me. The time is so limited that if I should undertake to go into anything like a statement or argument in relation to water gas, I could not do it justice. I can only make a few general remarks in regard to the water gas process, and that is all I ask to do at this time. I shall confine myself particularly to the process which we call the Allen-Harris process, which we have been running at Poughkeepsie for five years past. I will say in regard to the quality of the gas, which has a good deal to do with any process, that we have received the universal commendation of our consumers, and I think that there is no company making a better or more uniform gas than we are, which we call water gas. It has been very frequently stated by coal gas men that the gas is poisonous. Several gentlemen of prominence have said to me that it was poisonous. They were, at the same time, smoking their cigars. I said, "Gentlemen, it has been charged that tobacco is a deadly narcotic poison." I was recently in New York, and I had a pamphlet put into my hands showing that poison enough could be extracted from one pound of tobacco to kill 150 men. But tobacco is still used without fear of results. Why? Because it is used in such a diluted form, and not as an extract, that many consider its use beneficial instead of injurious. So in regard to carbonic oxide. Its use in gas for illuminating and heating purposes is in such a diluted form that no danger need be anticipated.

We have delivered more than 100,000,000 feet of water gas in Poughkeepsie, and not a single complaint of any injurious effects have ever been suggested. I consider carbonic oxide one of the most important elements in illuminating gas. Hydrogen and carbonic oxide are permanent gases which produce the highest calorific intensity of any of the gases. It is the calorific intensity which produces the high candle power of the gas, and prevents its smoking. You are already aware that carbon is a mineral, and not a gas. It has the power of assuming the form of gas. It needs a permanent supporting gas to be present when it is volatilized to take it up and carry it off. Having that permanent gas ready in sufficient quantities, the moment this gas is volatilized (whether from coal or from oil, it makes no difference), there is a volume of that permanent supporting gas to take up and chemically unite with the carbon, and carry off to the holder a pure, brilliant, and incondensable gas.

The difficulty with you is this—that you buy the cheapest coals; you do not use the rich cannel coals that we have in great abundance in this country, and for which there is but little call except to the extent of from 5 to 10 or 20 per cent. for enriching. You do not use these coals; you cannot use them under the old process. You have, even in the cheaper coals, more carbon than you can utilize to advantage. You must make a supporting gas. What do you produce? You produce carburetted hydrogen, or marsh gas, which forms 45 per cent. of the volatile carbon in the ordinary coal. It requires only from 7 to 10 per cent. of the luminants to produce a 16-candle gas. What becomes of the rest? Look at the incrustations in your retorts; look at your tar; look at the trouble you have with naphthaline, stoppages of the pipes, and all those things, because you do not have a supporting gas to take that up the moment it ought to be taken up. If it is not taken up the moment it is volatilized, it is lost. That is the trouble. You were here discussing the subject of how you can keep your standpipes clean. If that carbon is taken up when it is volatilized, by the necessary supporting gases, there will be nothing deposited. If we can use clear oil, which is nearly all carbon, and have the gas carried off without any stoppages of the pipes or incrustations in the retorts, can you say anything against the process? We have done it for five years, and are doing it to-day.

Mr. Cartwright (Philadelphia)—How?

Mr. Allen—Our system is unique. There is no other one that is running in the same way. We are running our retorts *continuously*. I have a little sketch of what we call a "set," which consists of two hydrogen benches and an oil bench in the centre. The water gas is made by sending superheated steam in finely divided jets through incandescent carbon. In that way the steam is decomposed. The more perfectly that is done, the more perfect will be your gas. From the hydrogen benches the hydrogen or water gas is conducted through a vaporizer, into which oil is turned at the same time, and, becoming volatilized, it mingles with the water gas and is swept down into the lower retort of the oil bench, and on through the upper retort to the standpipe. Two hydrogen benches make sufficient

water gas to be carburetted by one oil bench. This is all brought up through the centre bench and is carried out by one standpipe, passing through one uniform degree of heat. You work differently. You put your material into your retorts, each of which has a standpipe. The most volatile and the best part of the carbon goes up in black smoke out of the standpipes before your heats are high enough to make gas. Your trouble comes from that. You are wasting carbon, and that forms the stoppages in your pipes. Naphthaline and ammonia and impurities in your gas are formed how? By the continual drawing and charging of your retorts every four hours, your heats are down and up. When one equivalent of nitrogen and three of hydrogen unite over a red heat, you form ammonia, you do not form illuminating gas. So, with different heats you form different combinations. Many of these combinations are impurities that you do not want. You then go to the expense of purifying the gas from these impurities. How much do you purify per bushel of lime? I believe that it is generally from 5,000 to 7,000 feet.

Mr. Cartwright—That is about half.

Mr. Allen—From 14,000 to 16,000? I have not heard it stated as high as that before. I have called upon a great many gas engineers. Perhaps they have not given me the facts, but I have never heard it placed at so high a figure. Lime varies. We are using the ordinary slaked stone lime from Glens Falls. We are purifying 35,000 feet on an average per bushel of lime. I only mention this to show what I think is evidence of the superiority of our process. If you run your works at low heats, you will make poorer gas than when you run at high heats. But when you run at high heats the discussion here has shown that you have even greater difficulties to contend with. But the demand of the community is to-day for good gas. You must run high heats. You cannot run them in a way to make poor gas. You must make good gas, of high candle power. A difficulty has been stated to me within a few weeks by prominent gentlemen in Brooklyn, who have studied this subject. They have said: "Mr. Allen, if we could only get the white light that you have in your gas, we would be all right." I said to them, "That is just what you are lacking. You have a yellow rim around your flame which is simply unutilized carbon. You have not strong enough combustion in your gas. You cannot get it in the ordinary process of making coal gas. Your proportion of hydrogen and carbonic oxide are not sufficient to utilize the illuminants.

Now, in regard to the poisonous effect of carbonic oxide, let me say that it is all a bugbear. There is nothing in it. I have a certificate from Prof. Cooly, of Vassar College, a very eminent chemist. He certifies that he has used our gas for five years with great satisfaction, and he continues to use it, although he is fully informed of its component parts, without the least alarm in regard to the consequences. We have the certificates of Prof. Silliman and Prof. Wurtz in regard to the gas. They fully analyzed it. They certified that water gas will vitiate a given quantity of air in a room to a much less extent than coal gas. If you think of it for a moment, you will see that it is so. Every particle of oxygen that is in the carbonic oxide supplies just so much oxygen which combustion requires, but which coal gas must take from the atmosphere in the room. Every particle of oxygen in the carbonic oxide is so much help to the combustion of the gas, and therefore does not vitiate the air in a room as much as if there was not that quantity in it. This is self-evident. There have been three cases of blowing out gas at Poughkeepsie within the last two years. One of them was that of a young gentleman who came from Texas to attend Eastman College, and put up at the Morgan House. He went to bed at about 11 o'clock on Saturday night, and blew out the gas. He lay there until 11 o'clock on Sunday morning. Not making his appearance, they broke open the door and found him lying unconscious near the door. A physician who lived in the house was called, and the young man, being exposed to the air, immediately revived. He was not injuriously affected at all. He took tea at the public table and went to the school in the morning. On another occasion, two farmers came to the Northern Hotel and staid over night. They blew out the gas, and were in the room all night. In the morning they got up and went down to breakfast. They thought the air in the room did not smell as pure as country air, but they were not injuriously affected at all. In both cases ordinary 4-foot burners were left open, and the doors and windows were closed. When you speak of water gas as being dangerous, it is a mistake. It is not as dangerous as ordinary coal gas. I do not believe there is a case on record where a person has been exposed to coal gas the same or one half that length and survived.

Water gas has been used by eminent physicians in Germany and France as an anesthetic without any deleterious effects. Carburetted hydrogen, or marsh gas, which is the basis of ordinary coal gas, cannot be used for that purpose. It kills instantly.

As to the cost, like Mr. Pearson I have no objection to telling any gentleman of the Association, but I do not think it would be fair to ask me to state it publicly. I believe that I can say, however, that we can show better results from our works than can be shown in behalf of any company here in regard to the net profits from the same consumption of gas, and if I cannot I will give it up. I would be glad to show these papers to any gentleman who would like to see them. We have been working at this system for ten years, and we think we have brought it to perfection, and that no one can find fault with the results if they will only examine them.

Mr. Forstall—I would like to ask Mr. Allen if this process is in use in other places besides Poughkeepsie?

Mr. Allen—No, sir.

Mr. Forstall—Has it ever been tried at any other place?

Mr. Allen—Yes, sir.

Mr. Forstall—Has it ever been given up after having been tried?

Mr. Allen—Yes, sir.

Mr. Forstall—What were the reasons for giving it up?

Mr. Allen—We put it in some years ago in New Haven. That was the first place. Judge Boardman was then the President. It was run for five months under the supervision of Professors Silliman and Wurtz, and it was probably subjected to the longest and severest scientific analysis that any gas ever had in this country, and, perhaps, in the old country. I wanted to be thoroughly satisfied in regard to the scientific basis of the process before I went further with it. We commenced at Fair Haven, where this work was done, with only three benches, afterwards it was put into four benches in the New Haven works. They were very small, old-fashioned benches, originally made for iron retorts, and did not allow a good draft. Mr. Cox, the engineer, unintentionally did a thing which was very much against us. He thought to economize the heat by putting the boiler up over the benches. He made a great mistake, for when he had a direct draft under his arches he had no steam that answered our purpose. When he could get good steam by having a draft under his boiler he had a poor draft under the arches.

Mr. Cartwright, of Philadelphia—Where did his heat go to?

Mr. Allen—Mr. Wood, of Syracuse, can tell you about that. Having the builer up over the arches it formed an indirect draft, and this destroyed the necessary draft under his benches. He could not get good heats under his benches and boiler at the same time. We have now got it arranged so that we get the best kind of steam with our boiler over the arches, and the best kind of heats under the benches by having an air blast, and dampers between the chimney and the furnaces. I believe all who have visited our works admit that we have splendid heats under our benches, and we have fine steam also. But at Fair Haven we labored under the disadvantage that I have spoken of. Their Board ordered a new set of 16 benches, or eight double benches, to be put up for our process. They had them all built, and Mr. Cox ordered the superheaters to be made, and he ordered them to be one inch larger each way than we made them. By mistake they were made one inch smaller each way. He had 40 ordered and 30 were sent up. We did not want them put in because they were too small and would probably prove a failure. They had to fire up the benches and that prevented our process from going in there. Judge Boardman, who, by that time, had become a good friend of our process, died. I have had no means of knowing what the difficulty was subsequently; but the process did not go in afterwards.

Mr. Libby, the President of the Citizens Gas Company, in Brooklyn made an arrangement for our process, and put in three benches—that is two hydrogen, and one oil, benches. They ran them one year—1874—and, as Mr. Libby himself said that, although making one-third, or less, of the gas made, the whole was so much improved that complaints were reduced from 30 or 35 a day, to four or five, or a merely nominal number, the gas being so much better than before. They used only 5,000 tons of coal that year, instead of 18,000 tons as used formerly. Coal gas interests, however, were not satisfied. Finally, in 1875, they were ordered to go back to coal. They went back. Now, for the result. There was trouble amongst their consumers. It was said the trouble came from Mr. Libby putting in the new process. He resigned; but before resigning he sold every share of his stock except ten from $1.20 to $1.50. They went back to coal, and their stock is selling at .60. The Boston Gas Commission published the fact, as reported at the office of the Citizens Gas Company, that in 1874 they made more gas than they did in 1875, and they charged their consumers in 1875 $50,000 more for gas than in 1874, and made $8,000 less money. Dr. Wood, one of the commissioners, told me these facts, and they were afterwards published as I have stated them. They are none of my getting up. They are facts; and yet they persisted in going back to coal. Now, they have an opposition water gas process in Brooklyn, and the President of the Citizens Gas Company has made an arrangement with that company to supply his company with water gas. Those who know the facts must exercise their own judgment as to whether or not they have been treated any more fairly than they would have been treated under our process. If you will look into the water gas process, gentlemen, you will find that there is a good deal more in it than you perhaps are disposed at present to admit.

Mr. Forstall—How long has it been since the process was tried at Fair Haven?

Mr. Allen—Nine years—When we established ourselves at Poughkeepsie we were desirous of demonstrating our process to the satisfaction of gas men. They said, run it a year and let us see what it will do. We ran it a year and they said run it two years, and we have run it five years. We try to convince gas men by facts and figures, and not by threatening opposition works. If they can make better and cheaper gas than we can, we do not expect them to adopt our system. But if they cannot, I believe it will be to their interest to come and see us. I am only saying what I believe to be for the interest of the gas companies. The community demands a good and cheap gas. I say we can make it cheaper and better under our process and divide the profits with the consumer.

Mr. Cartwright, of Philadelphia—I think in justice to Mr. Pearson, who was kind enough to mention the cost of his gas in the holder that, as Mr. Allen has drawn a parallel himself, he should give us the cost of his gas in the holder. Then we have some standard of comparison; otherwise we have not.

Mr. Allen—I will give it to you, or to any gentleman here; but if I give it to the Association as a body I ask that my figures should not go upon the record.

The President—It will not be reported.

Mr. Cartwright—It can be omitted from the regular report of the proceedings if you desire it.

Mr. Allen—I am not willing to give the figures here publicly unless it is with that understanding.

Mr. Cartwright—We are called upon to judge of several processes by a comparison; and yet, when we bring these men to the crucial test in order to form a judgment, they are not ready to give us the facts and figures that are necessary in order to form a correct estimate of the value of their processes, and we know nothing about them unless we try them. Those having these processes, and advocating them, should be armed at every point so as to show to the fraternity what they are doing. We all know pretty nearly what coal gas costs us put into the holder. Mr. Pearson has kindly given us the cost of his gas in the holder, and we have it in other cases of the Lowe process; but we have never heard, or I have not, at all events, of the cost of gas in the holder by the so-called Allen-Harris process. So far as I am concerned, I would like to hear it; and, if Mr. Allen desires it, we can leave the figures out of the published report.

Mr. Allen—I would rather my figures should not be published, not that I would say anything here, or produce any figures that were not true; but, for obvious reasons, however, I do not wish them made public.

Mr. Ludlam—I do not think Mr. Pearson gave the cost of his gas per thousand. Under these circumstances I do not think Mr. Allen should be called upon to give the cost of his based upon what Mr. Pearson said.

Mr. Pearson—I gave the cost in the holder, and I gave the quantity of material employed. You can draw your own conclusions from that.

Mr. Allen—I will make a statement similar to that of Mr. Pearson.

August, 1880.

Gas manufactured	1,760,600 feet.
Average daily consumption	57,213 feet.
Average candle power	17.63 candles.
Materials used and cost per 1,000 feet in holder—	
14.287 tons of stove coal, at $4.75	$67 00
41.422 tons of grate coal, at $4.45	183 34
1.317 tons of chestnut coal, at $2.71	3 10
7,760 gals. naphtha, at 3½ cents	271 60
Labor in works, 4 men	201 50
Total	$726 54

September, 1880.

Gas manufactured	1,937,300 feet.
Average consumption	64,577 feet.
Candle power	17.89 candles.
Materials used were as follows—	
14 59-2240 tons of stove coal, at $4.75	$66 62
44 1098-2240 tons of grate coal, at $4.45	198 00
7 2200-2240 tons of chestnut, at $2.71	21 65
8,561 gals. naphtha, at 3½ cents	299 63
Labor in works, 4 men	195 00
Total	$780 90

Mr. Pearson—Could you give us the cost for material separately? You have given us the cost for the month. I do not think all of us have taken the figures down. You have stated the cost in the holder. How much of that was for material, and how much for labor?

Mr. Allen—I have stated each item.

Mr. Pearson—You gave it for the whole month. You gave so much material used in the manufacture. Some of us did not take it down. Did you give the amount per 1,000 feet?

Mr. Allen—I gave the cost of all the materials.

Mr. Pearson—What I want to know is, how much per thousand feet it cost you for material—for oil and for coal—and how much for labor? Will you kindly give us that? You stated that it cost so many dollars for work for the month, and so many dollars for material.

Mr. Allen—I have stated that the whole amount manufactured in September 1880, was 1,937,300 feet, and that the whole cost was $780.90. With the same help and about the same fires we could have made an average of 100,000 feet per day, with the only additional cost of the necessary oil, which would have reduced the cost of the manufacture very materially.

Mr. Pearson—Will you kindly state how much it cost per thousand feet for material and how much per thousand feet for labor?

Mr. Allen—I have not calculated it in that way.

Mr. Butterworth—Does that include the amount paid for clerk hire?

Mr. Allen—It includes all the cost of labor and materials in the work of putting gas into the holder.

Mr. Forstall—I move that a vote af thanks be tendered to Mr. Allen for his remarks. (Unanimously adopted.)

The President—Mr. Goodwin is, I understand, prepared to make a statement in regard to heating by gas. If he will now come forward we shall be glad to listen to him.

Mr. Goodwin spoke as follows:

I have frequently been asked as to the heating power of gas stoves, and as to the best form for utilizing the heat produced by the combustion of gas in them. These questions cover considerable ground. In order to answer them as intelligently as possible, I have made a few experiments, and will give you the result.

I constructed a portable room, so arranged that the walls could be set up in a large room and removed at pleasure. Its size was 8×10 feet, and 10½ feet high—equal to 672 cubic feet of space. The entrance to the room was through a door. A space of one inch was allowed around the room between the bottom of the walls and floor, for the free circulation of air from the outside. The walls of the room were supported on blocks at the four corners. The doors and windows of the larger room in which this room was placed being thrown open.

My tests were to determine the difference in heating capacity between stoves containing atmospheric burners and those containing burners for illuminating gas and copper reflectors, and an arrangement of drum through which air passed and was heated before entering the room. The form and construction of stoves tested will be seen in figs. 1, 2, and 3. (See next page.)

Fig. 1 shows the internal construction of the atmospheric burner stove; fig. 2 the internal construction and fig. 3 the external form of the stove using the illuminating gas burner and reflector.

The following is the result of the tests with stoves 8 and 9 inches in diameter:

Eight-inch plain heater, atmospheric burner, connected with outside of room to carry off produts of combustion—

Time.	Temp. Outside.	Temp. Inside.	Meter.
2 h.	70°	71°	479 feet.
2 h. 37 m.	70°	84°	485 feet.

Time, 37 minutes; gas burned, 6 feet; increase of temperature, 13°; pressure, 1½ inches; 672 cubic feet of air heated 13°=1 cubic foot heated 8,736°.

Eight-inch reflector heater, with illuminating burner, connected with outside of room to carry off products of combustion and convey fresh air to stove—

Time.	Temp. Outside.	Temp. Inside.	Meter.
9 h. 17 m.	70°	70°	426 feet.
9 h. 55 m.	71°	91°	432 feet.

Time, 38 minutes; increase of temperature, 21°; consumption, 6 feet; pressure, 1½ in. Fresh air admitted to room through stove, 40 cubic feet; temperature on entering stove, 70°; temperature on leaving stove, 280°. 672 cubic feet heated 21°=1 cubic foot heated 14,112°, an increase of 5,376° per cubic foot over the peceding test=61 per cent.

Test of a 9-inch heater, with atmospheric burner, connected with outside of room to carry off products of combustion—

Time.	Temp. Outside.	Temp. Inside.	Meter.
12 h. 52 m.	71°	72°	472 feet.
1 h. 28 m.	71°	84°	478 feet.

Time, 36 minutes; increase of temperature, 12°; consumption of gas, 6 feet; pressure, 1½ in.; 672 cubic feet heated 12°=1 cubic foot heated 8,064°

Test of a 9-inch reflecting heater, with illuminating burner, connected with outside of room to carry off products of combustion and convey fresh air to stove—

Time.	Temp. Outside.	Temp. Inside.	Meter.
10 h. 28 m.	67°	70°	455 feet.
11 h. 05 m.	69°	90°	461 feet.

Time, 37 minutes; increase of temperature, 20°; consumption of gas, 6 feet; pressure, 1½ in. Fresh air admitted to room through stove, 50 cubic feet; temperature on entering stove, 67°; temperature on leaving stove, 280°. 672 cubic feet heated 20°=1 cubic foot heated 13,440°, and increase of 5,376° per cubic foot over the preceding test=66 per cent.

This stove is constructed so as to take a certain quantity of fresh air from the outside of the room by means of a pipe connected to the lower part of the stove (Fig. 2), which is conducted to an internal drum, which is heated at the bottom and side by the gas, the products of combustion from the gas being passed out of the stove through a pipe, and thence conveyed to a flue, or outside the room, thus preventing the contamination of the air, and the unpleasant odor so often noticed where gas stoves are used in close rooms. In the plain heater first tested the increase of temperature resulted almost entirely from radiation, whereas, on this stove, we also had the benefit of reflectors and convected heat. Thus it will be seen that the 8 inch reflector showed an increase of 61 per cent., and the 9 inch 66 per cent. over the plain stoves of the same outside dimensions, consuming the same quantity of gas in practically the same time—the actual difference being, in each test, one minute. With an introduction of fresh air into the room through the stove after being elevated to 280°, and all the products of combustion removed from the room. *It is all wrong*, in my judgment, to undertake to put a gas stove into a close room *without providing some means to carry off the products of combustion.* It prevents the increased use of gas heaters more than anything else you can do.

I have made some tests as to the amount of heat developed, and quantity of gas consumed, in a given time in gas cooking stoves. Time of each test, ten minutes—

Number of Stove.	Capacity of Oven. Cubic Inches.	Gas Consumed. Cubic Feet.	Temperature, Deg. F.
5	780	1.9	420
7	1122	2.3	360
8	1635	3.1	390
9	1635	3.8	480
10	3465	5.1	460
11	3153	5.7	420
12	4752 (large oven)	4.2	360
12	2016 (small oven)	3.3	360

It will be seen by examining the figures that the large stoves are more economical than the small ones, when the size of oven, quantity of gas consumed, and temperature are computed together and compared with the No. 5 and 7.

I will state that three No. 10 stoves do the cooking for the patients in the Cincinnati Hospital. When I visited that institution some time ago these stoves were cooking the food for 450 patients and their attendants.

Mr. Starr—At a cost of what?

Gen. Hickenlooper—At a cost of 35 cents per day.

Mr. Goodwin—I will here say that Col. Jones, the Superintendent of the Hospital, made a test of the following character. The stoves were placed

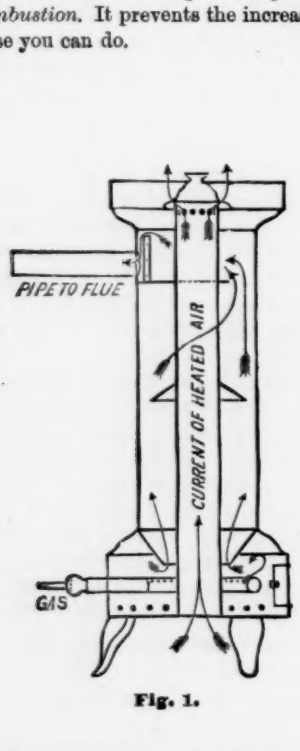


Fig. 1.

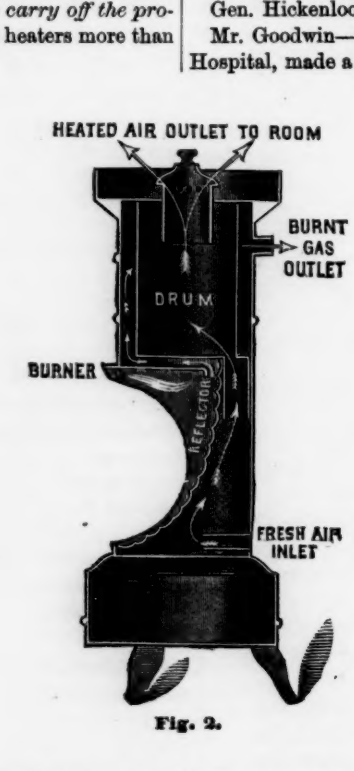


Fig. 2.

Fig. 3.

in the Hospital, with the understanding that they were to be tested in competition with the coal range then in use. I did not know the cost of coal used, but resolved to make the trial, with the distinct understanding that unless the gas stoves proved more economical than the range they were not to be accepted.

The test was as follows:

The coal used in the ranges for seven days was carefully weighed. At the end of that time the same weight of coal was placed in the retorts of the gas works and turned into gas and coke. I do not remember the figures exactly, but, whatever the amount of coal consumed in the stoves, all the cooking was done with 50 per cent. of the gas made from the coal, the other 50 per cent. being used for illuminating purposes; besides this they had all the coke remaining after the gas was made.

It is only necessary to say they took the stoves. (Applause.)

Another question I have frequently been asked is this: Why do you not use atmospheric burners altogether in heating the ovens, instead of illuminating gas? The same question has been considered in Europe. Having read in the London *Journal of Gas Lighting* of some tests that were made bearing on the subject, I resolved to make similar ones. For that purpose I had a box constructed of tin, of a width and length to fill a No. 7 heating oven, depth 1 inch. On the front edge were placed, at an angle of 45°, two pipes, for filling the box with water and for inserting thermometers. The first test was with an atmospheric burner placed in the roasting chamber, and the box placed about two inches below the burner. In the test the tin top of the box was left bright. Amount of gas consumed, 14¼ cubic feet; time, 55 minutes, at which time the water was brought to the boiling point.

The second test was under the same conditions with an illuminating burner. Time, 55 minutes; gas consumed, 14.2 cubic feet, at which time the water reached the boiling point. I then blackened the tin, and the water was made to boil in 20½ minutes, instead of 55 minutes, with a consumption of 5.3 cubic feet in each case. The tin box being within two inches of the burner, gave every chance in favor of the atmospheric burner.

These tests were made the day before leaving for this meeting. Had time permitted, I would have placed the vessel at the usual roasting distance, in which case the result would have been largely in favor of the illuminating burner. I think this proves quite conclusively that the atmospheric burner has not the advantage over the illuminating burner, for roasting purposes, that is supposed to exist.

Some time ago I was called upon by parties engaged in the manufacture of cigars, to undertake to heat a close room, and maintain a temperature therein of about 140°, and to maintain a moisture in the room sufficient to steam tobacco placed therein. I mention this because some of you gentlemen may have manufacturers of cigars in your cities who may be disposed to try the plan, which, if adopted, helps to increase the consumption of gas.

The room was about 8 feet wide, 16 feet long, and 10 feet high. The temperature was maintained at about 150°, with sufficient moisture from the evaporating apparatus to thoroughly steam the tobacco, and proved a success.

Another party, whose factory had been destroyed by fire, called upon me for the same purpose, desiring to adopt the plan in their new factory. Their room was about 12 feet wide, 30 feet long, and 10 feet high. The ap-

paratus was placed therein, and since that time has maintained a sufficient moisture, and a temperature of 145°, without a variation of over 2 to 3 degrees. The air is conducted to the burners in the heaters by a flue from the outside, the products of combustion being carried out of the room. A large evaporating pan is placed over the heater, and circulation maintained by a considerable quantity of pipe brought into contact with the products of combustion. The water is maintained at a uniform level from the outside by a suitable arrangement designed for the purpose.

Tobacco men tell me that heretofore they have had considerable trouble in maintaining the temperature to within 20 to 30 degrees of what they desired. The object is to color the leaf. Before being placed in the sweating room it is quite light and yellow; after submitting the leaf to this process it comes out a rich brown color, and looks equal to the best Havana leaf. By this means Connecticut and Pennsylvania tobacco is made to rival Havana in appearance. Gas has been called to the aid of the tobacco men, and it has proved a success.

Mr. Littlehales—Have you any idea of the relative cost as compared with the cost of coal that would have been necessary to have accomplished the same result?

Mr. Goodwin—The amount of gas used by the first parties was about 15 feet per hour, until the temperature desired was reached, after which the gas was lowered to probably 8 or 10 feet per hour. In the large room, two burners, of 15 feet each, were placed in the heater, making a total of 30 feet per hour. After the desired temperature was reached, one of the burners was dispensed with, the other being sufficient when lowered to from 10 to 12 feet per hour.

Mr. Littlehales—Was the room specially constructed for the purpose of heating by gas?

Mr. Goodwin—Yes, sir; I told the parties that if they would construct the room in the way I suggested I would undertake the job. There is not the least difficulty in getting the heat up to 150°, which is all they require, and maintaining it at that point constantly.

Mr. Littlehales—I move that a vote of thanks be tendered Mr. Goodwin for the valuable information he has given us. (Carried.)

The President—The papers have all been read and discussed, and we are about through with our business, with the exception of Mr. Page's address this evening upon the subject of coal tar and its products. But before he begins his address, I believe we are to devote an hour to remarks upon members who died last year. Many of these men were distinguished in their profession, and I suppose some of the members present will desire to say something in reference to them.

Mr. Wood—It has occurred to me that it would be more satisfactory to appoint a suitable committee for the purpose of preparing, on behalf of the Association, a proper expression of our respect for the memories of these deceased members. The report of the committee can be published in our regular proceedings.

Gen. Hickenlooper—In the case of similar proceedings in a society with which I am connected, it has been the custom for a number of years for the president and secretary to constitute a committee to take the course suggested by Mr. Wood. They compile a biographical sketch of the lives of the deceased members, their character and services, and present it at the next meeting.

The Secretary—The very object I had in view in proposing that remarks be made by the members was to avoid the stereotyped, bald and unfeeling business of resolutions. A committee is appointed, and resolutions are prepared which are the merest platitudes. I think we ought to spread upon the record, and transmit to the families of the deceased members, a spontaneous and heartfelt expression of our respect for their memories and regret at their loss. For my own part I would rather have one such tribute paid to my memory from one who knew and loved me than volumes of resolutions. There is another view of the matter that I should like to have passed upon, and that is that when notice of the death of a member reaches the Secretary, he should be empowered to send a brief circular to each member of the Association stating the fact that such a member has departed this life. As it is now, twelve months must elapse before, as an Association, we know that a member has passed away.

Gen. Hickenlooper—The object suggested by the Secretary is accomplished by the course I have suggested. In that way we avoid all this wholesale flattery, and simply make a short biographical statement of the character and services of the deceased members, expressing, at the same time, in fitting language, our appreciation of their character and services. This is preserved in an imperishable form, and can be transmitted to the family and friends of the deceased.

The President—Do you make that motion?

Mr. Wood—I accept the suggestion of General Hickenlooper that a committee, consisting of the President and Secretary, be requested to prepare brief biographies of these deceased members, and cause them to be published in the forthcoming volume, and also that the Secretary notify the Association of the death of members when they occur. (Carried.)

On motion, the Association then adjourned until eight P.M.

Evening Session—October 14th.

The Association met at eight P.M., pursuant to adjournment.

The President introduced Mr. Geo. Shepard Page, of New York, who delivered the following address upon

RESIDUAL PRODUCTS.

Mr. President, Ladies and Gentlemen:

It is needless for me to premise what I have to say by assuring you that I appreciate the honor of standing before you on this occasion. The engineer of the Marquette Gas Light Company sent a small specimen of a substance he had extracted from coal tar, supposing it to be aniline oil. The Association referred it to me to determine what it was. I think he has been, in a small way, distilling his coal tar in order to obtain the light products, and the oil to use again in enriching his gas. (Laughter.) It is evidently the light oil of the coal tar, containing, perhaps, some ammoniacal liquor. Aniline oil is a very different substance. This would be worth, perhaps, ten cents per gallon; but aniline oil, used in making the best aniline dyes, such, for example, as are used in these beautiful fabrics before you, is worth about five dollars per gallon. I think, however, that this engineer located in the wilderness, as we may say, deserves great credit for investigating one of his residual products. I am sure that one beginning thus will steadily advance in the acquisition of knowledge concerning his coal tar products.

I understand the announcement was made this afternoon that I would talk to you this evening simply upon the subject of coal tar, its products and their uses. But in the invitation extended to me I was also requested to explain the value of that other residual product—ammoniacal liquor. In this connection, permit me to exhibit to you on the blackboard a drawing of the most complete apparatus for making sulphate of ammonia. After you have examined this drawing, I will show you some of the results of this process, and will exhibit to you various ammoniacal products that are found in the market. Most of them are imported. I presume most gas engineers have seen ammoniacal liquor. (Laughter). Here is a specimen. Perhaps the ladies would like to test the odor. (Laughter). This was taken from the Chicago gas light company's works. I have not tested it; but I should judge it to be what is termed "three ounce liquor." It is not beneficial to the manufacturer of sulphate of ammonia to use ammoniacal liquor of much less than eight or ten ounce strength, which is being obtained in some of our large cities by what is termed the "Mann system," or the "Tower scrubber." I presume most of you have seen it; and it is, therefore, needless for me to describe it in detail. The tower is usually filled with coke, boards or lath, scrap tin, various appliances being used to divide the current of gas passing up, and the volume of water passing down. The objection all undoubtedly find to that system is that a portion of the gas passes up the channels gradually created without coming in contact with the water, so that the ammonia is not all taken from the gas. I presume you will all agree with me that it should be all taken out in order to get the highest illuminating power. The scrubber that is now extensively used in Europe, introduced about three years ago, is what is termed the "standard scrubber." It is a horizontal apparatus of iron, from six to nine feet in height, and four or five to six feet in diameter. A shaft run through the centre dividing it into sections of from five to ten or eleven each. On the shaft are arms carrying discs of sheet iron—forty of them on each arm. There are indentations all over these discs. This shaft revolves four or five times per minute. The gas passes in one way and the water passes in at the opposite end. The water is drawn off at the other end, and the result is ammoniacal liquor of from ten to thirteen ounces. All the free ammonia is taken from the gas, and a large percentage of sulphuretted hydrogen and carbonic acid. Its cost is much less than the tower scrubber. Small works can introduce this one to advantage. I think the question of producing as much ammoniacal liquor as possible will speedily become as important to gas companies as that of receipts for coal tar; and my object in bringing this apparatus to your attention is to do what I can in hastening the time when the largest amount can be realized from the sale of ammoniacal liquor.

Let me tell you what is done on the other side. About ten years ago I visited Dublin, and I found all the ammoniacal liquor utilized, and converted into sulphate of ammonia; and, upon further investigation, I discovered that there was not a single gas company but what utilized that product in one way or another.

The process of manufacturing sulphate of ammonia, which is the chief method of utilizing the ammoniacal liquor, you will see represented on the blackboard, and I can more readily and more quickly explain it by reading a description of the drawing.

A, filtering pipes for arresting oily matters, etc., placed in a suitable position above the level of the condenser. B, closed tank containing condensing

coil, N. C, boilers, with agitators, vacuum, pressure, and water gauges, safety valves, etc. D, saturators, wooden vessels lined with lead, having well for collecting and removing the sulphate; gas chamber, marked D, in which the gases given off collect and pass away by the pipe K; and draining bench, also of wood, covered with lead, and attached to the side of the saturator; E, tank for mixing the lime solution. The manipulation of the process is extremely simple. Any ordinary mechanic can make sulphate of ammonia. But one man is employed in utilizing and working up the ammoniacal liquor in the Leeds Gas Company. The ammoniacal liquor being conveyed into the filtering vessel, A, it passes thence into the closed tank B, and, as required, into the boilers, C, through the pipe, I.

At the commencement of the operation the tank, B, and one of the boilers, C, are filled to their respective levels, marked and indicated by gauges on the boilers and side of condenser.

On boiling the liquor, the ammonia and other gases contained therein are disengaged, and, with a certain amount of vapor, pass up the pipe, F, and through the condensing coil marked N, in the tank, B. These gases and vapors in their passage give up the greater part of their heat to the liquor in the tank B, which causes a large portion of the gases contained in such liquor to be driven off and carried by the pipe marked G into the pipe F, and there mixing with the gases which are coming from the liquor in the boiler marked C, they together pass into the saturator, D.

When the whole of the gases are driven off from the liquor in the boiler, (ascertained by opening the tap on the pipe, F), a bushel of lime (1 bushel of lime, with sufficient water added to make it about the consistency of cream), is run in and kept well mixed with the liquor by the agitator marked O. After this liming operation, which should liberate the whole of the remaining ammonia, the waste liquor in the boiler is allowed to cool, and is then discharged from the boiler by the pipe H, care being taken that the agitator is kept in motion during the time the waste liquor is being run off, so as to insure the salts of lime formed being properly discharged, and not allowed to accumulate on the bottom of the boiler. The boiler being again refilled from the tank B, by means of the pipe I, the foregoing process is repeated.

The gases from the coil, N, pass into the saturator, D, containing strong sulphuric acid (sp. gr. 1.845), to which has been added two parts of water. The lower end of the pipe leading from the coil and marked J, is made of lead, and reaches to within 3 inches of the inclined bottom of the vessel, its extremity having a rose, as shown. The whole of the ammonia passing into the acid is fixed, forming the sulphate, the gases liberated being carried away by the pipe K, which should not project below the under side of the top of the vessels. The salt as formed falls down the incline, L, into the lower parts of the saturator, from which it is occasionally removed and placed on M to drain.

The manufacture of sulphate of ammonia from gas liquor consists in submitting such liquor, freed from oily matters, to the action of heat, which expels all the free ammonia and its volatile salts, together with the other gases contained therein. When freed from these, a solution of lime is added to the remaining liquor in the boiler, for the purpose of liberating the ammonia from other salts of the body, which all ammoniacal liquor produced from the distillation of coal contains in a greater or less degree.

The general vapors given off pass forward into a vessel containing sulphuric acid, which arrests the ammonia, allowing the other gases to go forward to a furnace, to be burned or otherwise dealt with.

The apparatus required for the above should consist of a filtering vessel filled with sawdust, fine breeze, sand, or other filtering material, condenser, boiler for driving off the gases and vapors, tank in which to mix the lime, solution and saturator, to contain sulphuric acid, for arresting the ammonia and forming the sulphate.

You will thus see that the process is as simple as it could very well be. It can be used in all classes of works. Let me give you the results on the other side. In the utilization of ammoniacal liquor last year the Leeds Gas Light Company averaged for their ammoniacal liquor 75 cents per ton of coal carbonized. I believe there is no company in the United States that receives over 10 cents per ton carbonized. If the Leeds Co. had converted their liquor into sulphate, they would have done even better than that.

Permit me to show you some of the products of ammoniacal liquor, and to state some of the uses to which they are put. You are all familiar with aqua ammonia. Here is a specimen of it. I show a specimen of another product of ammoniacal liquor—sulphate of ammonia. That is made by the apparatus represented on the blackboard, which I have already described. The chief use of that is as a fertilizer. It contains from 25 to 27 per cent. of ammonia, If the same law prevailed in the United States that exists in England, the demand for it here would take all that would be produced. The manufacturers of American fertilizers do not put enough ammonia in them. State inspectors by and by will remedy this.

But another important use of this product is in making alum. Alum from sulphate of ammonia is made more cheaply than in any other way. I show you a specimen of ammonia alum. It is made on an extensive scale in England. That industry will soon be established in the United States. Here is muriate of ammonia, another important product. All of these specimens are from the stock of Messrs. Fuller & Fuller, the largest chemical house in the West, and one of the largest in the world. They told me to-day that the larger part of their stock of these ammonia products, all in constant demand, come from the ammoniacal liquor of European gas companies. Here is the carbonate of ammonia. It is an ingredient in the Royal Baking Powder, and is used by all baking powder manufacturers. Those of you who are familiar with the growth of this business during the past five or six years, can form an idea as to whether or not the demand for that article is likely to be diminished. This specimen is muriate of ammonia—these beautiful crystals. Aromatic spirits of ammonia is familiar to most of you.

These specimens that I now show you are iron and ammonia, ammoniated copper, and bromide of ammonium. There are many others here, but I will not take the time to enumerate them. It is unnecessary for me to go further. You see that there is a market at home for your ammoniacal liquor whenever you make it of marketable strength.

As I am expected to say something upon the products of coal tar, it may be proper for me to tell you how my attention was first called to the subject. While living in Boston, 24 years ago, I read this item in the *Annual of Science*, edited by the late Prof. Pierce, of Harvard: "The wonders of chemistry. Ten processes from coal producing a substance worth its weight in gold." The ten processes were then given—coal, coal tar, crude light oil, crude benzole, refined benzole, nitrobenzole, crude aniline, aniline oil, roseaniline, magenta, the latter being worth $323 a pound. The item closed thus: "The diamond is to come." That never faded from my mind. The next time my attention was called to the value of coal tar was 2 years later, in Salem, Mass. I saw a workman heating a black substance in an iron kettle on the street. I asked him what it was, and he said it came from coal tar. I asked him how it was made. He said he did not know. I found that it was coal tar pitch, made by destructive distillation. The following year my interest in coal tar was aroused at the exhibition of the Mechanics' Charitable Association, of Boston. In an exhibit of chemicals were some coal tar products. One of them was a substance many of you have seen—the oil of myrbane, sometimes called from its odor, though incorrectly, artificial oil of bitter almonds. I could not help thinking what a wonderful substance this coal tar must be, yielding the beautiful and valuable coloring material, the exquisite perfume, and the useful pitch; and from that time I have been constantly identified in making, what was then a waste product, of value.

Now, as to the processes and products. We have here a coal familiar to Western gas makers, Youghiogheny, and this other specimen from Erie. From every ton of these coals carbonized there is deposited in your hydraulic mains a substance called coal tar. The hydrocarbon, being heavy, falls to the bottom, and is constantly running away to your tar tanks. That is the substance you see here—black, always black; sticky, always sticky a bad odor, always a bad odor. Gas men get rid of it in various ways. Some burn it. That is a terrible waste of coal tar, (laughter), as I think I shall be able to show by the facts and figures presented for your consideration. The business of distilling coal tar is conducted in this country, with the exception of one or two companies, in a very crude way. The vapor given off is passed through a pipe in a condensing tank, and the first liquid condensed is this. It is called the light oil of coal tar, because it is lighter than water. As the heat gets higher, the distillate becomes heavier than water, termed in this country the heavy or dead oil. The English term it more accurately creosote oil. One or two firms carry the distillation still further. They run the heats still higher, and obtain this substance—anthracene oil. After the anthracene oil is taken out then there is left what is called hard or fuel pitch. Ordinarily, however, the distillation is carried simply to the point of making and leaving a pitch, such as you have seen just opposite the hotel in filling in between the paving blocks around the post office. The ordinary process of distillation of coal tar in the United States creates but those three products, light oil, heavy, or creosote oil, and pitch, the respective values of which are as follows:

Light oil, 15 cents per gallon; heavy oil, from five to seven cents per gallon; and the pitch from five to seven cents per gallon. These are not large values, it is true, and hence the tar distiller in most of our cities cannot afford to pay over twenty cents per ton for coal tar. But if the heat is carried to 500°F., greenish crystals form thickly upon the surface of the tar distillate—"green grease" we call it. This is passed through woolen filters, and then subjected to hydraulic pressure, the resultant being this substance—anthracene of 50 per cent. purity. One of the most interesting discoveries in practical chemistry was that of anthracene, followed by one later, which gave great value to this—alizarine, or artificial madder. I have only to call your attention to this elegant Turkey-red fabric from the famous looms of Garner & Co., Cohoes, N. Y., to these woolens, to this yarn, to

these prints, and you witness its varied uses. For years, and, indeed for centuries, the sole source of alizarine was the madder root grown in Holland, France, Turkey, Russia and Syria, and it required three years or more to gather from the ground the coloring matter which was taken out by chemical process. But this substance, anthracene, is found to yield the identical compound. The same chemical elements can be taken from anthracene and put together cheaper by chemical process than they can be extracted from the madder root. Alizarine was discovered, in 1869, by the distinguished chemists Graebe and Liebermann, of Berlin. I have here one of the earliest specimens of commercial anthracene which was obtained by me in Glasgow, in 1870. At that time it was worth only $100 a ton. In two years, so rapid had been the advances in the practical chemistry of converting anthracene into alizarine, that its value rose to $2500 a ton. Since that time the agricultural madder-growing industry has disappeared, and the chemist produces a better and cheaper substance from worthless coal tar for dyeing the world's fabrics Turkey-red.

To return to this chemical aniline. It was discovered by W. H. Perkin, in 1855. I have the honor of numbering him among my correspondents. I have here a history of the coal tar dyes that he was kind enough recently to send me, which was read before the Society of Arts, in London. Let me, at this point, inform you how he made the wonderful discovery of the aniline dyes. The Peruvian or chinchona bark trees in Peru and in the East Indies, it was thought, were dying out. The physicians of London went to Hoffman, a great chemist of that city, and requested him to endeavor to make quinine artificially. He knew that the elements of quinine were lodged in coal tar. He began the work of separating them. He employed the services of one of his brightest pupils, Perkin. The latter carried the process on from the light oil to the benzole, from the benzole to the nitrobenzole to the aniline oil, and then, putting in a certain chemical, suddenly a gorgeous red color was produced. You remember it was called "Magenta," and the second dye "Solferino," the battles having just been fought. This was in 1855. That was the brilliant discovery that led to this magnificent result (pointing to the silks, satins, worsteds, etc., exhibited on the stage). He at once stopped searching for quinine, and immediately began the erection of works. I show you here an engraving of the works erected by him. In 1858 they had grown to the size shown on the upper part of the page. In 1870 he began making alizarine. His works grew until in 1873 they covered ten acres, as illustrated in this second engraving. You will appreciate the marvellous growth of this industry when I tell you that in 1873, 17 years after his accidental discovery of aniline, he sold these works, receiving a check for $750,000. In the meantime he had accumulated a vast fortune. Our water gas friends say they do not want this vile residual, and do not make it in their process. (Laughter.)

In this same book Mr. Perkin gives the following figures of the sales of aniline and alizarine dyes in 1878: Germany, £2,000,000, or $10,000,000; England, £450,000; France, £350,000; Europe, £350,000; total, £3,150,000 or, in round numbers, $15,750,000.

Is it not humiliating that the United States is of necessity omitted from this roll of honor.

You could not get any such figures from water gas residuals. (Laughter.) It seems to me, gentlemen, if there is nothing else that stands out prominently before you as affording a hopeful outlook for the industry you represent, these figures alone would be sufficient to give you courage, if you had need of it. (Applause.)

I have told you that the light oil produces benzole, and that it is not only used in making aniline dyes, but it is also required in photographic chemicals, and for many other purposes. It finds a ready sale at from 65 cents to $1.50 a gallon. If not sold as benzole, it is converted into oil of myrbane or nitrobenzole. One house in Chicago buys this material in quantities of from ten to twenty thousand pounds, at a cost of about 30 cents a pound. A New York manufacturer and other dealers also buy to an equal extent. Whiskey makers use it to give the smoky flavor to "Genuine Irish Whiskey" made in Kentucky; and lager beer brewers use it to "age" their beer, notwithstanding it is a deadly poison. This need not alarm you, as it is a well known fact that the gas fraternity is strictly temperate.

There is a market for every pound that is made here. The bulk of the trade is supplied by foreign importations, as only one American firm produces oil or myrbane.

We return again to these aniline crystals from nitrobenzole, which Perkin made in 1855. They were then worth $323 a pound, but by increased facilities for manufacturing, by cheapening the chemicals, and by improved processes, they are now sold at from $3.50 to $10.00 a pound. The light oil also yields naphtha, toluol, and zylol. Then there is left a thick substance which, after passing through various processes, is converted into this pure white, solid crystal, carbolic acid, a substance familiar to all of you. It is used to a large extent in medicine and surgery, and in the mechanical arts, and the demand is rapidly increasing each year. There is produced in this country annually about 50,000 pounds of crystallized carbonic acid, and about 150,000 pounds of liquids; and yet, from across the water, comes every year an exceedingly greater quantity. From carbolic acid is made that very useful product, salicylic acid. Those of you who have suffered from rheumatism have undoubtedly had it administered to you. Of course, no member of this Association ever had the gout. (Laughter). Should any gas engineer find time to have it he will probably experience relief by taking salicylic acid. It is also extensively used by beer brewers and wine makers to check fermentation. Here is another product from carbolic acid, picric acid. Among other purposes this is used for making a powerful explosive. Its chief use, however, is as an orange dye. The beautiful yellow and orange mats are dyed with it.

We return to the heavy or creosote oil. It contains a substance called cresylic acid, somewhat similar to carbolic acid, except that it does not crystalize. This is sold to druggists, and by them to dentists, who use it in place of wood creosote. It is used for various purposes in the mechanical arts. This beautiful liquid, cresolene, is also obtained from the creosote oil. It was discovered by a French chemist, in 1865, that hydrocarbon deposited in the bottom of your purifying boxes gives off a vapor, when the boxes are open, that has a curative effect upon the zymotic or germ-produced diseases, as whooping-cough, asthma, scarlet fever, diphtheria, etc. You have doubtless, frequently admitted to your purifying room persons suffering with some of these diseases, particularly whooping-cough; and you probably know of many cures having been effected. The agent performing the cure is cresolene. In 1877 an American chemist whose child was suffering from the whooping-cough, and too sick to be taken to the gas works, conceived the bright idea of taking the gas works to the child. He procured from the purifying box of the gas works the condensed hydrocarbon and vaporized it for a few nights in the sick room, and the child was cured. Cresolene is now being sold by druggists for that purpose. I have personal knowledge of over three hundred cures of whooping-cough effected by the use of cresolene, vaporized in this little apparatus I hold in my hand. The gas profession is not only a benefactor to mankind, in producing materials from which these beautiful colors are obtained, but also in affording to suffering humanity the relief that is obtained by the use of carbolic acid, salicylic acid, creosote and cresolene.

The chief use of the crude creosote oil is as a preserver of wood. It is used not only to preserve wood from decay, but in the case of piles in docks and bridges, from the attack of the *teredo navalis*, or marine worm, in salt water, which often cuts off an unprotected oak, spruce, or yellow pine pile, two feet in diameter, in three or four months. This process has been in general use in England during the past 42 years. Nearly every railroad tie and bridge timber is creosoted. I exhibit you a photograph of a *teredo navalis* that, in two years, grew to the length of 18 inches. It came from the Gulf of Mexico, near Pascagoula. I show you also a section of yellow pine timber. That dark space you observe was creosoted. The *teredo* excavated the wood in every part except where creosoted. All the piling of the bridges of the Mobile and New Orleans Railroad is creosoted, they having erected large creosoting works at Pascagoula. Other railroad companies have also taken advantage of it, viz., the Houston and Texas Central, the Louisville and Nashville, the Old Colony and Eastern Railroads of Massachusetts. There are several other works in operation for creosoting timber in Boston and New York; but this important industry can scarcely be said to have begun. Wherever this creosote oil is produced in sufficiently large quantities, say, in Chicago, St. Louis and Cincinnati, creosoting works will be erected for the preservation of wooden pavements that now only last from a year and a-half to three years; and for the preservation of railroad ties, the life of which averages about three years, and involve an annual outlay of about $600 per mile for renewal, I will mention an incident which will serve to show in what direction the current is setting. As I crossed the Hoboken ferry, to take the train on my way to Chicago, immense piles were being driven for the foundation of the buildings of the Hoboken ferry houses, and these piles were all creosoted. (Applause). Whenever you look at a paper or book you see coal tar on it. Creosote oil is burned in a peculiar furnace which permits the smoke to be condensed in a large closed apartment. It falls, like black snow, upon the floor, and is gathered and ground with linseed oil, producing printer's ink. So you see that even the press is dependent upon coal tar! (Applause.)

There is another product from coal tar, which the ordinary coal tar distiller never likes to see. Gas engineers also dislike to see it. That product is naphthaline. But naphthaline is, to-day, the most interesting of all the long list of remarkable products of coal tar. These brilliant, fast colors more glorious than the aniline dyes, are being produced from this naphthaline. One of our most distinguished chemists says that, from present indications, the time will come when it will pay to run gas works to *make naphthaline, selling gas as a bye-product!* (Applause). The rich gold colors the ladies are wearing are produced from naphthaline. You see some of them here. There has never been anything created by the art of man so

beautiful as the colors that are abstracted by the chemist from naphthaline. These colors are fast. In that fact lies their chief value. Aniline colors are often evanescent; but, although they fade, they fade all over alike. The ladies are learning to use the aniline dyes when a silk dress becomes faded. Many of the ladies are producing at home nearly as beautiful effects upon old silks, in re-dyeing them, as the dyers at Paterson can produce.

Let us proceed a step further. We have this substance that I now show you. pitch. It is used for many purposes; in making gravel roofs, in the wooden pavements in the streets of our cities, for lining the inside of powder kegs. No moisture can pass through it. It is also being largely used in the construction of vaults, the bricks being dipped into it, so that the vault is kept free from dampness. I believe the time is coming when cesspools, reservoirs and sewers will be constructed in this way, so that our houses will be made proof against filtration from sewers and cesspools, and our homes escape contamination. It costs but little more than the ordinary method of building with cement. The source of probably one-third of the ills which flesh is air to, especially in the country and villages, would be obviated by this simple expedient. Dr. Chandler, President of the New York Board of Health, recently made this statement to me.

We now come to the hard pitch. When the company with which I have been identified commenced manufacturing anthracene, we accumulated the hard pitch—tons upon tons of it. There was no use for it, but we adopted a plan by which every ton was eventually utilized. And for what? Why, we mixed 10 per cent. of this material with 90 per cent. of anthracite coal dust, and manufactured a fuel to be used upon locomotives. Here is a specimen brick. (Applause.)

Here is a method, and a profitable one, too, of not only utilizing this hard pitch, but also of utilizing the dust of anthracite and bituminous coal. That is a very important consideration. Every fourth ton of anthracite coal is converted into dust, and five million tons are annually wasted in this way. The industry is yet in its infancy, although the fuel is being used upon several railroads in the east, and the works of the Anthracite Fuel Co., at Rondout, N. Y., which some of you have doubtless seen, have turned out 150,000 tons of this artificial fuel. You all know the vast quantity of bituminous coal that railroad companies and other industries use, and you can form some judgment of the enormous loss there must be from the now valueless dust. Coal tar pitch alone furnishes a medium by which this waste coal can be made of value.

When the distillation of the tar is carried to the final point, two other substances are obtained, one called pyrene, the other chrysene. This last is perfectly white. Then is left this coke. Even the electric light yonder pays tribute to coal tar, its carbon points being largely composed of this coke, which is 97 per cent. carbon. I do not know whether it is policy to produce a substance that furnishes carbon points for electric lights.

We come back again to anthracene and its derivatives. I show you this brown liquid paste, the commercial product "ten per cent. alizarine." This phial contains the pure, brilliant red, needle-shaped crystals. How beautiful they are. But alizarine is not sold in that form to dyers, but in a paste, which is imported from England and Germany in barrels, $2,000,000 worth each year, and $5,000,000 of the aniline crystals. Think of it! Seven million dollars paid by our manufacturers for these two coal tar products!

It seems to me, gentlemen, that it is a reflection upon the intelligence of our chemists that they did not do years ago what must first be done before these substances can be produced here, and that is to call the attention of your profession to the rapid growth and immense value of the industry, and to show you how your coal tar and other crude products can be profitably utilized. But the coal tar industry cannot be profitably carried on until the coal tar produced at the great centres, and within a radius of 100 or 150 miles of them, is gathered at a certain point within that radius, and utilized under the direction of skillful chemists. A great quantity of coal tar must be gathered together before these products, the bases of aniline and alizarine can be profitably extracted. How much anthracene do you suppose there is in coal tar? But one per cent., and practically but one-half per cent. is obtained. When I tell you that one house has received for that one-half per cent., in 8 years, obtained from the coal tar produced by 10 gas companies, $500,000, do I not offer a powerful argument in favor of urging forward the agglomeration of the coal tar, so that it will pay to take out anthracene in sufficiently large quantities to make the industry a profitable one?

About 3 per cent. of benzole and 2 per cent. of carbolic acid can be produced from coal tar. By having coal tar gathered together in large quantities, these, and the other substances I have shown you, can be profitably extracted, but not otherwise. I have collected estimates, easily verified, based on practical experience, showing that 5 to 7 per cent. of fine products, from, say, 4,000,000 gallons of coal tar, yields $170,000, while the immensely larger proportion of from 93 to 95 per cent. yields but $200,000. If this industry is thus established, in due time American chemists can supply the manufacturers of these magnificent silk, woolen, cotton, and leather goods throughout the country with aniline and alizarine dyes, for which such an immense sum is now paid to foreign manufacturers of these products. We can place our manufacturers on a level with those of Manchester and Lyons, who are now obtaining these dyes at one-half the price paid for them in the United States. On an importation of $7,000,000, our manufacturers are paying a duty of over $2,000,000—35 per cent. ad valorem, or 50 cents per pound. I ask you, gentlemen, if you know of any industry more worthy of being established here, or one that offers a more brilliant future than this? (Applause.)

One of the most beautiful substances obtained from coal tar is uranine. The smallest particle will color a large volume of water or alcohol, as you see by this experiment. Before I go further, permit me to call your attention to these leather goods of different colors, all of which are produced from aniline dyes. Wherever you see leather with these bright colors, you may know they are from aniline. Indeed, it can almost be said of all colored fabrics that the dyes are from coal tar.

I come now to the practical part of my remarks. I do not appear before you simply to exhibit what you can observe in the windows of any large drygoods store. I come here to explain to you practical plans for obtaining more money from your coal tar and your ammoniacal liquor. Assume that within a circuit of 150 to 250 miles of the cities of Chicago, St. Louis, and Cincinnati there would be a carbonization of, say, from 200,000 to 250,000 tons. Then you have the following figures:

265,000 tons coal, at 15.1 gallons per ton, yield 4,000,000 gallons coal tar. The products are—

2,400,000 gals.	pitch, at 3 cents	$72,000
1,000,000 gals.	creosote oil, at 5 cents	50,000
20,000 gals.	benzole, at 75 cents	15,000
20,000 gals.	naphtha, at 50 cents	10,000
20,000 gals.	black varnish, at 25 cents	5,000
5,000 gals.	carbolic acid, 95 per cent., at $1.50	7,500
7,500 gals.	" 85 " at $1.00	7,500
10,000 gals.	" 75 " at 75 cents	7,500
3,333 gals.	(30,000 lbs.) carbolic acid crystals, at 40 c.	12,000
20,000 gals.	(200,000 lbs.) anthracene, 50 p. ct. at 40 c.	80,000
6,667 gals.	(60,000 lbs.) oil myrbane, at 30 cents	18,000
2,777 gals.	(25,000 lbs.) creosote, at 40 cents	10,000
150,000 gals.	(1,500 tons) tarred felt, at $50	75,000
3,665,277 gals.	Total	$367,500
	Value of coarse products	$200,000
	Value of fine products	167,500
	Total	$367,500

The prices I have given here are fair market prices for the chemical products named.

Expense of Working 4,000,000 *Gals. of Coal Tar.*

Labor—40 men at $2 per day for 300 days	$24,000
Factory expense	10,000
Fuel	10,000
Transportation	15,000
Expense account	3,000
Interest, taxes, insurance	10,000
Repairs	5,000
Superintendence	5,000
Chemicals	10,000
Dry felt, 750 tons, at $80	60,000
Total	$152,000

The agent of one of the largest railroads in the country says that his company will transport the coal tar in tanks, as oil is transported, at the rate of $2 per ton for 150 miles or under, taking the loaded cars to the point desired and hauling the empty cars back, so that the cost for 150 miles for transportation will not be over 40 cents per barrel.

Cost of Plant to Work 4,000,000 *Gals. Coal Tar.*

Ground, 60 acres	$5,000
Tar stills, 50 bbls. each, at $500	5,000
Fitting stills, at $250	2,500
Pipe and connections, condensers	2,500
*Tar tankage, 20,000 bbls	2,500
*Oil tankage, 5,000 bbls	500
Benzole and naphtha apparatus	2,500
Oil of myrbane apparatus	2,500
Carbolic acid and creosote apparatus	5,000
Anthracene apparatus	5,000
Four saturating machines, at $625	2,500
Lumber, incidentals, labor	5,000
Four tank cars, tank barge	9,500
Total	$50,000

*Tar and oil tankage is created at this low cost by using condemned canal boats and barges.

As shown by these figures, we have a margin of not less than $200,000.

In regard to the utilization of the ammoniacal liquor, I submit the following figures:

Plant	$25,000
Labor, sulphuric acid, lime, fuel, transportation, repairs, interest, insurance, taxes, superintendent, per annum	50,000
Product, 7,950,000 gallons 10-ounce liquor yields 5,300,000 pounds sulphate, at 4 cents	212,000

Profit, $172,000, or 65 cents per ton of coal.

In conclusion, let me show you the actual results in money value to be obtained from these residual products by the gas companies of the United States. I think most of those present who have given the subject consideration, will agree with me that the gross carbonization of coal is about one millions of tons annually. This would yield of sulphate of ammonia, twenty millions pounds, having a value of $800,000. The present receipts, carefully estimated, are $63,400. Here is a deficiency, in this one residual, of $736,600.

The coal tar product is about fifteen millions of gallons, which, according to the results I have read to you, ought to yield the gas companies of the United States, $1,120,000. The present receipts do not exceed $200,000, or an average of 20 cents per ton of coal carbonized, leaving a deficit of $920,000, which, added to the deficiency in the receipts from ammoniacal liquor, makes a total of $1,656,000. These figures must prove to be an incentive to you to bring about the utilization of these two residual products in a manner that will yield the largest results. You certainly have no cause for discouragement even though inventors and capital are seeking to introduce other processes of producing light. You hail the advent of the steam stoker which never strikes, and that costs so much less than manual labor, and performs its work so economically and satisfactorily. New fields for the introduction of gas are opening upon every hand. Gas heating stoves, gas cooking stoves, gas engines, and gas furnaces will speedily win their way to popular favor. Do not be handicapped by unsound notions of economy; but if, when you are convinced that it is economy to use the steam stoker, and that these results can be obtained from your residual products, you go forward with unhesitating steps—there is no no department of trade in the country to-day that has a more bright and promising future than yours. This is the earnest conviction of one who has been identified with your industry for 21 years, who has paid to gas companies for coal tar, in that time, over $1,300,000, and who looks forward to 21 years more of active, and, I trust, profitable labor in the same field.

I thank you, ladies and gentlemen, for the patient and courteous attention with which you have listened to me. If I have given you any information that is interesting and valuable, and from which good will result, I shall be highly gratified; but, be that as it may, it has given me sincere pleasure to have had the privilege of addressing you. (Applause.)

The Secretary—I move, Mr. President, that the thanks of this Association be most heartily tendered to Mr, Page, for the unusually interesting and instructive, not paper, certainly, but lecture that he has favored us with.

The President—It gives me great pleasure to put this motion, for I am sure that every member of the Association who has heard Mr. Page appreciates most thoroughly the valuable and interesting information he has given us.

The motion of the Secretary was unanimously carried.

Mr. Page—Permit me, Mr. President, to move a vote of thanks to the house of Field, Leiter & Co., of this great Northwestern Metropolis, who have kindly furnished many of the materials for this beautiful exhibit. Mr. Higginbotham, of that house, directed me to go through their stock, and to select whatever I wanted, and that whatever I desired for my purpose should be sent here. I would also move that a vote of thanks be extended to the house ef Fuller & Fuller, who likewise most courteously said to me that whatever I desired to bring here was at my service, and we are indebted to their kindness for most of these beautiful ammonia products to which I have called your attention. (Carried.)

Mr. Page—I intended to state that I should be glad to answer any questions that the members of the Association desire to ask. It is possible that I may not have made myself perfectly understood upon some points; and, if so, I shall be pleased to make any explanation or give any further information that may be called for.

Mr. Helme—I should like to inquire if the coal dust composition making the fuel bricks that he referred to is anthracite coal or bituminous coal?

Mr. Page—The Anthracite Fuel Company now use a mixture of anthracite and bituminous. The works are located at the farthest point north at which they can get the benefit of cheap transportation by water and reach those northern coal burning railroads. You will understand that the only use that is made of these bricks is for fuel for locomotives. Several of these northern roads, the Renssalaer & Saratoga, the Albany & Susquehanna, the Walkill Valley and others use this artificial fuel.

Mr. Helme—At what price can it be sold per ton?

Mr. Page—I think, at $3.50 per ton.

Mr. Helme—Will it do as much service per ton as anthracite coal?

Mr. Page—From 11 to 14 per cent. better results are obtained; 5,000,000 tons of this product, requiring 500,000 tons of pitch, will be made this year in Europe. The Paris Gas Light Company, one of the largest in the world, and the Chartered Gas Light Company, of London, sell their entire pitch production for artificial fuel from waste coal dust. This industry would, perhaps, follow the establishment of these large coal tar operations at a common centre like Chicago, Cincinnati, or St. Louis. For instance, waste breeze and waste bituminous coal can be gathered in the same way that the coal tar is, and mixed with the pitch that will be produced, and this fuel, manufactured just as it is by the Paris Gas Light Company. The two things could be worked together very advantageously.

Gen. Hickenlooper—I would ask Mr. Page if he would be willing to take the leadership in this matter.

Mr. Page—I have had correspondence and personal interviews with foreign chemists with reference to the best and cheapest way of producing carbolic acid, cresylic acid, salicylic acid, oil of myrbane, anthracene, and all these different products, upon which this industry depends largely, on the other side. American chemists have not been educated practically, and there seems to be a lack of experience among them in this direction. But on the other side there are numbers of men employed in these great chemical works who have for years been making these products, and who are obtaining but small salaries. I have in mind a man employed in one of these houses who is the manager of the concern, having created a business which extends to China, Japan, and North and South America, and who received but $500 per annum. Such men will come here very quickly for $1,000 to $1,500 a year. I will say, further, that, while not binding myself to superintend any such company or undertaking, yet, whatever time and assistance I could give would be devoted to the enterprise if desired.

Mr. Helme—It strikes me that it is really worthy of our attention. Undoubtedly, in looking carefully into the matter, we may find many difficulties to contend with. We could afford to lose a little money in developing this business. We could form a company and put it under the charge of some person from the other side, as Mr. Page speaks of, and if we lost money for a few years, we should very soon get it back if the business was a success. Besides, we should then be able to sell our gas for something nearer the price that they sell it for on the other side. We all know that in many instances gas is sold over there for absolutely less than it costs us to put it into our holders, and the fact that they are able to utilize their residuals to such an advantage is probably the principal reason that they can afford to sell their gas so cheap.

Major Dresser—I had a conversation with Mr. Arson, the chief engineer of the Paris Gas Works, and I asked him that question. I said to him that a Yankee gas man would like to know, if he did not mind telling, how much it cost him to put his gas into the holder. He smiled, and said that they did not figure it in that way. He said, "The truth is, our residual products pay all the expense of making our gas, and our only expense is in distributing it." That shows whether this industry spoken of here will pay. It would be an experiment to start such an operation here simply as regards the locality, but not as regards the facts in the case. It has been done by the Paris Company for years, and two years ago the Chartered Company, of London, erected large works at Beckton for carrying on this same operation. They were forced to it, begging Mr. Page's pardon for reflecting upon that noble fraternity of coal tar men, because the coal tar men got up a corner on them, and the coal tar men are left out in the cold now. The Chartered Company is carrying on the operations on a very large scale, and it is deriving a very large profit from them. So far as the success of the thing is concerned, it may be considered as already established. It only remains for us to put forth that energy that we generally put into anything we take hold of, guided by practical common sense, to make it a success here, and remove from our profession in this country those insinuations, that I must say are justly deserved, of throwing away what ought to pay the expense of making our gas.

Mr. Helme—In his strictures upon us Mr. Page must bear in mind that it has not been a great many years since this color business was started, or, at least, assumed anything like its present proportions. I understand that the demand has increased.

Mr. Page—Very rapidly; probably to the extent of from a half a million to a million of dollars a year.

Mr. Helme—The fact that the demand for these colors has increased and is increasing so rapidly is really an encouragement for us to move in the matter.

Mr. Page—Not only the manufacturers of silk, but the manufacturers of carpets, of cotton goods, of wall paper, of fancy leather goods, and many others, use these colors from coal tar products. I do not wish to be understood that I have reflected at all upon the low price paid for coal tar by the

coal tar distillers of the United States. Nearly all of them but the three products, light oil, heavy oil, and pitch, and they cannot afford to pay but little more, if any, than they are paying now. I confirm what Major Dresser has said about the Chartered Company. Messrs. Burt, Boulton & Haywood, the most extensive coal tar distillers in the world, had a contract with the Charter and the Phœnix Companies for an amount per annum of 15,000,000 gallons of coal tar, and are making these finer products. They bought the Perkins color works, at a cost of $750,000. It is reported by the best chemical houses in London that they have made in the past seven or eight years not less than $10,000,000. They were not willing to divide fairly with the Chartered Company, and the Chartered Company was not to blame for refusing to renew the contract, and erecting works for utilizing their residuals themselves, and realizing the profits. Their production during this year will be 500 tons of anthracene which they will sell for $400,000. Mr. Butterworth has asked me what the sulphate of ammonia apparatus, placed upon the blackboard by my friend Mr. Hersey, of London, costs. The cost of an apparatus for works carbonizing, say, 10,000 tons, would be about $3,000. The expense would be somewhat less for works carbonizing a smaller quantity of coal. It is not necesaary to run them every day; they can run for a week or two, and then shut down again.

Mr. Forstall—As we are now assembled for the last time, I think it would be proper to testify to the Chicago Gas Light and Coke Company our appreciation of the reception it has tendered us to-morrow, and the elaborate programme that has been prepared for our enjoyment. I would therefore move a vote of thanks to that Company and to its President, Mr. Watkins, for the hospitality, courtesy, and kindness extended to us at his hands.

(Carried with applause.)

The Secretary—There being no further business before the Association, I move you, sir, that it now adjourn *sine die*.

The President—Before putting the motion to adjourn *sine die*, permit me to express my gratification, in which I hope you are able to join, at the success of our eighth annual meeting. While it is true that, unfortunately, several of our Eastern brethren have not been able to be present, whom we always miss when they are absent, yet, on the whole, this meeting has been a very enjoyable and a very profitable one. The papers that have been prepared with great detail and with elaborate care, and the discussions upon them have been very interesting, practical, and instructive. Now we are about to separate. We have heard since we met here that several of our members who were with us last year are no more. It is not at all likely that we shall all meet again precisely as we are now. It is probable that, when next October comes round, some of us will have been laid away in the grave. Let us not forget that. I wish you all a most happy return to your homes, and that as many of us as Providence will permit, may meet next October in the city of Boston, and that we may have a better meeting than we have had on this occasion, if that is possible. (Applause.)

The Association then adjourned *sine die*.

Sanitary Survey of Baltimore.

Dr. Chancellor's Report.

In a late Supplement of the Baltimore *Sun* will be found the report of Dr. C. W. Chancellor, of the Maryland State Board of Health, on the sanitary condition of Baltimore as determined by him in a sanitary survey made by him under authority from the National Board of Health, of portions of the city during the spring and summer of the present year. The report, which was transmitted on September 30th, to Mayor Latrobe, in manuscript, will appear in the tenth supplement to the official bulletin of the National Board of Health.

It is indorsed by Dr. Cabell, president of the National Board, as justifying the conclusion that Baltimore needs a complete system of sewerage in the place of the present unsatisfactory methods of removing excremental filth. Dr. Cabell, however, says that such a system of sewerage should not be undertaken until there has first been made a thorough topographical survey of the city and the country surrounding it, in order to determine the scientific conditions under which proper drainage can be effected.

Dr. Chancellor's survey was principally directed to the lower parts of the city, and the districts bordering on Harford run and Jones's falls. In parts of these sections poverty, overcrowding and filth were found, but no apparent excess of disease or of ill-health. On the contrary, he reports the "sanitary paradox," that the residents there were in as good a state of health as those in the higher and less crowded portions of the city. In part second of the report Dr. Chancellor describes with particularity the topography and drainage of the city, its different watersheds and levels, with the degree to which they have been improved and the difficulties arising out of the city's general configuaration. Jones's falls, Gwynn's falls, and the basin are discussed, and a variety of engineering suggestions are thrown out, the cost of which is obvious, while their expediency or necessity can hardly be determined in advance of such a topographical and geological survey as Dr. Cabell has recommended.

In his report Dr. Chancellor expresses regret that a more complete sanitary inspection could not have been made than one of certain parts of seven wards by policemen. Dr. Cabell, in his letter of instructions, informs Dr. Chancellor that "it is the desire of the board that the partial survey now ordered shall demonstrate to the satisfaction of the council the imperative necessity of a general system of sewerage for Baltimore." The report does not seem to make this necessity much more apparent than it has been all along to our citizens, as a matter in which we have made good, substantial, and comprehensive progress, and to which we will have to devote more labor and more money as our population increases.

Harford run is already being dealt with, the improvement and extension of other important sewers has gone on from time to time, and there is nothing in the report, either as regards the city's health or its sanitary deficiencies, to cause alarm, or to make the community imagine its sanitary affairs are in danger of being neglected and are not properly dealt with at the proper times. An undertaking of the magnitude of that which the National Board of Health insisted upon, as much before as after the partial sanitary survey, cannot be lightly thought of nor undertaken at once.—Baltimore *Sun*.

Nature's Big Gas Tanks.

Bradford, Pa., and neighboring places are lighted and heated by natural gas. In 1875 an oil company was sinking a well on a high hill west of Bradford. At the depth of several hundred feet they struck a vein of gas. No oil was found. The force of the gas was such that when it was ignited a pillar of fire more than fifty feet high was formed. The roar of the gas was heard for a mile or more. This burned for months. The heat was such that the grass and foliage grew in the depth of winter as luxuriantly for hundreds of feet around as it did in the summer. Strawberries ripened near this well in February. The well had been burning for a long time before the feasibility of utilizing it was thought of. A belt of dry territory, but yielding vast volumes of gas, was subsequently found to exist in the vicinity of the original gas well.

A company was formed to carry the gas into the city. It is now distributed all over the place by gas pipes. A gas pipe, with jets attached, is run into parlor and kitchen stoves. The supply of gas is controlled by a stopcock on the pipe. When a fire is wanted a lighted match is thrown into the stove and the gas turned on. The fire is started at once. The gas possesses great heating qualities, and apartments are heated by it as quickly and as well by it as by coal. Gas for illuminating purposes is conducted into the houses the same as artificial gas is taken in. At first the light was not brilliant and steady, owing to impurities. Processes for purifying it were applied, and now the natural illuminator is unsurpassed by the finest manufactured gas. It is so cheap that people seldom turn out their lights. It burns day and night in streets, hotels, private houses and stores. Consumers pay by the month instead of by the thousand. Gas wells have come to be more valuable than oil wells, and the sudden and phenomenal appearance of oil in some of the principal wells of the gas belt has created consternation among the owners and consumers.

For years the gas has flowed from the wells in unremitting volume. That oil was not to be found there it was thought had been conclusively settled. A few days ago one of the wells ceased in its gas supply. It was found to be half full of oil. Fifteen barrels of excellent crude oil were pumped out and the gas flowed again. One or two of the other gas wells exhibited the same phenomenon. It is necessary to pump the oil out daily before the gas will flow. This sudden appearance of oil in territory that before was considered dry has not yet been satisfactorily explained.—Philadelphia *Telegraph*.

Contract for Street Lighting in 23d and 24th Wards of New York City.

At a meeting of the Gas Commission held December 6th a contract was awarded to the Central Gas Light Company for lighting the public lamps in the Twenty-third ward for four months commencing January 1, 1881, at the rate of $10 75 for each lamp for the term.

A contract was also awarded to the Northern Gas Light Company for lighting the town of West Farms, for four months, commencing January 1, 1881, at the rate of $13 for each lamp for the term.—New York *Herald*.

Cementing Labels to Metal.—For attaching labels to tin and other bright metallic surfaces, first rub the surface with a mixture of muriatic acid and alcohol; then apply the label with a very thin coating of the paste and it will adhere most as well as on glass—*Amateur's Handook*.

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,
PROPRIETORS.

Editor—G. WARREN DRESSER.

PUBLISHED ON THE 2ND AND 16TH OF EACH MONTH
At No. 42 Pine Street, New York.

THIS IS a recognized official organ of—
LIGHT, HEAT, STEAM, WATER-SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE.

TERMS

SUBSCRIPTION—Three Dollars per annum, in advance.

AGENTS

NEW YORK—AMERICAN NEWS CO., 39 and 41 Chambers S
BOSTON—S. M. PETTENGILL & Co., 6 State Street.
PHILADELPHIA—PRATT & Co., Corner 9th and Arch Streets.
England—C. W. HASTINGS, 22 Buckingham St., London, W. C.
Germany—B. WESTERMANN & Co., of New York

MONDAY, JAN. 3, 1881.

Official Report of Examinations of Gas for two Weeks ending Dec. 24, 1880, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

1880. Dec.	Time of Day at which Test were made.	New York Gas-Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
		†	*	†	‡	*	†
13		22.66	19.33	24.61	23.48	19.42	25.34
14	Between	24.78	19.06	25.32	22.54	19.38	27.26
15	9.30 A.M.	23.73	19.90	24.66	20.91	18.99	28.25
16	and	22.82	20.26	22.97	21.94	19.35	26.74
17	1 P.M.	22.61	19.50	23.48	21.57	19.20	25.39
18		23.13	19.25	23.92	22.01	18.80	26.34
	Average	23.29	19.55	24.16	22.07	19.19	26.55
20		22.40	20.73	24.58	23.74	19.29	25.62
21		22 22	19.77	22.00	23.85	19.31	23.59
22		21.94	19.17	23.42	24.14	19.39	27.83
23		20.28	20.31	23.19	23.62	19.38	29.00
24		21.80	20.25	23.67	24.42	17.93	25.60
				*			
	Average	21.73	20.04	23.37	23.95	19.06	26.33

* Five foot ava tip with check.
† Bray's slit union, No. 7.
‡ Bray's slit union, No. 6.

E. G. LOVE, Gas Examiner.

Reduction in Price of Gas.

Consumers of gas will be pleased to note the fact that the Hannibal Gas Company announces an increase—not in price, but in their discounts. The company introduced a system of discounts at the beginning of the year, promising a further discount when they had secured fifty additional consumers. The required 50 have been secured, which indicates that the liberal policy of the company is meeting its reward; and Superintendent Decker announces a discount of 10 per cent. on all bills under 10,000 feet per month, and 15 per cent. on all bills over 10,000 feet per month. This latter figure reduces gas to $2.55 per thousand, and shows a determination on the part of the company to keep its promises and meet the consumer half way. The quality of gas is uniformly good, and the citizens and city have never been better served than by the present managers of the company.—Hannibal *Journal*, Dec. 8.

Accidents From Gas.

NOT FAMILIAR WITH GAS JETS.

S. Sherwood, of Westport, R. I., a guest at Earle's Hotel, blew out the gas in his room on going to bed Monday night. At 2 o'clock yesterday afternoon he was found insensible, the room being filled with gas. He was taken to the Chambers Street Hospital.—*N. Y. Tribune*, Dec. 16.

DEATH FROM IHALING GAS.

S. Sherwood, aged 28, of Westport, R. I., who was found insensible in his room at Earle's Hotel, Wednesday night, having blown out the gas on retiring, died yesterday in St. Vincent's Hospital.—*N. Y. Tribune*, Dec. 17.

ANOTHER WARNING TO THOSE UNUSED TO GAS.

A person registered at Sweet's Hotel, No. 4 Fulton street, Thursday evening, as C. W. Davidson, of Toms River, N. J. When he went to bed he forgot to turn off the gas. The room was without ventillation, and in the morning the occupant was found insensible in his bed. He was taken to the Chambers Street Hospital.—*N. Y. Tribune*, Dec. 18.

ASPHYXIATED BY GAS.

Mr. R. E. Stillwell, of Keyport, N. J., was found dead in his bedroom in the North River Hotel last evening. He arrived by the steamer Holdelm in the afternoon, and is supposed to have committed suicide, from the fact that when he was discovered the blinds and shutters and windows were shut close and the room was filled with gas.—*N. Y. Herald*, Dec. 25.

An American Chandelier at Sydney.

His Grace the Duke of Manchester has been making a tour of the provinces of the colony, and has everywhere met with a most hearty and cordial reception, nearly every town he has visited according him a public banquet or other compliment. On his return to Sydney, on the 29 of October, he was entertained at luncheon at the Town Hall by his Worship the Mayor (Mr. R. Fowler).

Advantage was taken of the occasion to unveil the new gasalier hung in the centre of the vestibule, and which has been provided by Mr. A. Bechet, of Barrack steeet. The 60 jets of the gasalier were instantaneously lighted by means of a suction battery and condenser balanced to the resistance of the lights. The eldest son of Mr. Fowler ignited the gas under the direction of Mr. Kopsch, and then his grace, similarly instructed, did the same. The chandelier is one of the largest of the kind in the world, and is of very choice design and first-class workmanship. This splendid chandelier was manufactured by Messrs. Mitchell, Vance & Co., of New York. Its shape is that of a double pyramid. It is composed of cut polished glass with silver mountings, exquisitly wrought. The citizens generally will, on inspecting this fine work of art, doubtless indorse the encomiums passed upon it by the company at this, the first public lighting. It may be stated that it is confidently expected that this new system of ignition by electricity, which Mr. Bechet has been the means of introducing into Australia, will be largely used in churches, public halls, fire brigade stations, and places of amusement.—*Sydney Daily Telegraph*, November 4.

Prices of Gas Coal.

The following are the prices at which the companies mentioned are shipping coal:

	New York.	Baltimore.	S. Amboy
Penn.....	$5.25	$4.10	$4.80
Scott's Youghiogheny..	5.00	3.75	
Montauk.....	5.00	3.70	
Newburgh Orrel.....	5.00	3.75	
Tyrconnell	5.00	3.75	
Despard.....	5.00	3 75	
West Fairmount.....	5.00	3.75	

To give some idea of the relative prices at the East and the West we give the following quotations of coal furnished by the Fort Pitt Coal Company:

At Pitsburgh, f.o.b. cars....	$1.30	per ton of	2000 lbs.
At Cleveland, f.o.b. cars....	2.90	"	"
At " f.o.b. vessels	3.05	"	"
At Buffalo, f.o.b. cars..	3.55	"	"
At Chicago, f.o.b. cars	3.60	"	"
At Indianapolis, f.o.b. cars.	3.00	"	"

Danger from Electric Lighting.

The light of the future—electricity—has already caused the loss of two lives abroad by careless handling. In Manchester, Eng., a person inadvertently touched the exposed connections and diverted the current through his body. On the Lavadia a similar accident occurred to a sailor who was hanging an electric light in the fire-room He grasped a brass rod which runs around it, and at the same time allowed one of the connecting wires to swing against his body, thus sending the powerful current through it with instant death as the result. With the rapid increase of electric lights in this country, the above record will show that they should not be handled by the inexperienced.—*Eng. News.*

Correspondence

[We are not responsible for the opinions expressed by Correspondents. Correspondents, in all cases, should sign their communications with their names and address in full—not for publiction, unless desired, but as a guarantee of good faith.—ED.]

Price of Gas on an Illuminating Basis.

Mr. Editor:—We sell 21-candle gas at $3.50 per thousand feet. Suppose we should make 16-candle gas—at what price should it be sold to make the cost to our consumers equal to the above price, for same amount of light; also, for 14-candle gas?

SUBSCRIBER.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
34 PINE STREET, NEW YORK CITY.
JANUARY 3, 1881.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	*Par.*	*Bid.*	*Asked*
Gas Co.'s of N. Y. City.				
Central.....	466,000	50	50	56
Harlem.....	1,800,000	50	62½	65
" Bonds	170,000			103
Manhattan.....	4,000,000	50	170	173x
Metropolitan.....	2,500,000	100	135	140
" Scrip...	$1,000,000	...	102	105
Mutual.....	5,000,000	100	60	65
" Bonds, gold.	900,000	1000	100	104
Municipal.....	1,500,000	100	150	155
" Bonds	750,000		106	110
New York.....	4,000,000	100	94	97
Northern.....	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	105	110

Citizens	1,200,000	20	55	57
" S. F. Bonds.	320,000	1000	100	105
Fulton Municipal	1,500,000	100	60	70
Peoples	1,000,000	10	28	33
" Bonds	290,000	...	90	95
" Scrip	250,000	...	75	85
Metropolitan	1,000,000	100	60	63
Nassau	1,000,000	25	47	52
" Ctfs.	700,000	1000	95	100
Williamsburgh	1,000,000	50	60	65
" Bonds		...	98	103
Kings Co	135,000	100	55	60
" Bonds	40,000	—	—	—
Richmond Co., S. I.	300,000	...	70	75
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	75	80
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	85	90
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			125	—
Cincinnati G. & C. Co.				190
Consolidated, Balt.			84	85
Bonds			109	110
East Boston, Mass		25	114	120
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	140	144
Hempstead, L. I.	25,000	100	...	—
Halifax N. S	400,000	40	148	150
Hamilton, Ontario	150.000	40	117½	
Jersey City	750,000	20	150	160
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	70	80
Laclede St Louis Mo	1,200,000	100	108	110
Montreal, Canada	2,000,000	100	148	149
New Haven, Conn		25	128	130
Oakland, Cal			35	36
Peoples, Jersey City		...	85	90
" " Bds.				5
Pittsfield, Mass			120	130
Rochester, N. Y		50	70	80
" Citizens		100	30	35
Rondout & Kingston			75	80
St. Louis Missouri	600,000	50	250	254
San Francisco Gas Co., S. Fr'isco Cal.			73	74
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—
" Scrip	500,000	20	125	—
Washington, D. C	1,500,000	20	215	225
Woonsocket, R. I	150,000	100	80	...
Wilmington, Del		50	174	...
Yonkers		50	—	70

The Municipal Gas Company, of New York, have declared a dividend of 5%, payable January, 7th, 1881. The Manhattan Gas Company have declared a dividend of 5%, payable on demand. The Mutual Gas Company have declared a dividend of 1½%, payable Jan. 10th, 1881. 225 shares of Harlem sold at auction at 65 1-8 to 65¼.

Advertisers Index.

Page

GAS ENGINEERS.

William Farmer, New York City ... 22
G. Warren Dresser, New York City ... 20

GAS WORKS APPARATUS AND CONSTRUCTION.

Herring & Floyd, New York City ... 19
T. F. Rowland, Greenpoint, L. I ... 19
Delly & Fowler, Phila., Pa ... 19
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 19
Stacey Mfg. Co., Cincinnati, Ohio ... 19
Bartlett, Hayward & Co., Baltimore, Md ... 19
P. Munzinger, Phila., Pa ... 19
Brown & Owen, Phila., Pa ... 19
Morris, Tasker & Co., Limited, Phila., Pa ... 14

GAS AND WATER PIPE.

A. H. McNeal & Bro., Burlington, N. J ... 18
Gloucester Iron Works, Phila., Pa ... 18
Robert Campbell & Co., New York City ... 18
James Marshall & Co., Pittsburgh, Pa ... 18
R. D. Wood & Co., Phila., Pa ... 18
Warren Foundry and Machine Co., Phillipsburgh, N. J ... 18
Mellert Foundry and Machine Co., Reading, Pa ... 18

WASHERS AND SCRUBBERS.

A. C. Wood, Syracuse, N. Y ... 282
G. Shepard Page, New York City ... 14

RETORTS AND FIRE BRICK.

J. H. Gautier & Co., Jersey City, N. J ... 16
B. Kreischer & Sons, New York City ... 16
Adam Weber, New York City ... 16
Laclede Fire Brick Works, St. Louis, Mo ... 16
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y ... 16
Borgner & O'Brien, Phila., Pa ... 16
Gardner Brothers, Pittsburgh, Pa ... 16
Henry Maurer, New York City ... 16

DIETERICH'S REGENERATOR FURNACE.

Charles F. Dieterich, Baltimore, Md ... 288

GAS METERS.

Harris, Griffin & Co., Phila., Pa ... 22
American Meter Co., New York and Philadelphia ... 23
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 23
Helme & McIlhenny, Phila., Pa ... 23

GAS STOVES.

The Goodwin Gas Stove and Meter Co., Phila. Pa ... 24
Retort Gas Stove Co., Providence, R. I ... 291

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y ... 17

EXHAUSTERS.

P. H. & F. M. Roots, Connersville, Ind ... 17
Smith & Sayre Manufacturing Co., New York City ... 17

GAS COALS.

Penn Gas Coal Co., Phila., Pa ... 21
Perkins & Co., New York City ... 20 21
Cannelton Coal Co., New York and Philadelphia ... 21
New York and Cleveland Gas Coal Co., Pittsburgh, Pa ... 21
Newburgh Orrel Coal Co., Baltimore, Md ... 21
Despard Coal Co., Baltimore, Md ... 21
Tyrconnell Coal Co., Baltimore, Md ... 20
Fort Pitt Gas Coal, Pittsburgh, Pa ... 21
West Fairmont and Marion Coal Co., New York City ... 20
Montauk Gas Coal Co., New York City ... 21

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa ... 282

STEAM STOKERS.

A. Q. Ross, Cincinnati, Ohio ... 15

PURIFIER SCREENS.

George D. Cabot, Lawrence, Mass ... 289

BURNERS.

G. Gefrorer, Phila., Pa ... 19

STREET LAMPS.

J. G. Miner, New York City ... 281

PURIFYING MATERIAL.

Connelly & Co., New York City ... 19

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City ...

PROCESSES.

Gwynne Harris New York City ... 18

EDGE'S PROCESS. REMOVING CARBON

D. D. Flemming, Jersey City, N. J ... 14

GAS FIXTURES.

Mitchell, Vance & Co., New York City ... 17

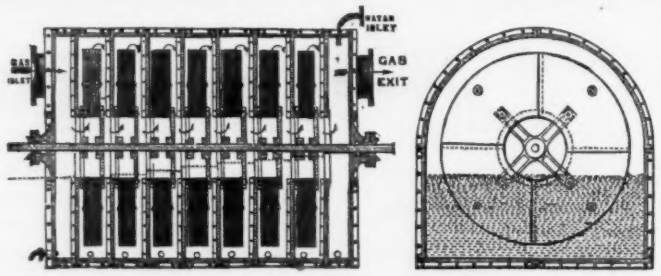
CEMENT.

S. L. Merchant, New York City ... 17
F. O. Norton, New York City ... 17

BOOKS.

Economy of Gas as a Fuel ... 16
Journal des Usines a Gaz ... 20
Gas Analyst's Manual ... 20
Scientific Books ... 18
Cathels' Gas Consumers' Manual ... 23
Fodell's Book-Keeping ... 23
Review of Gas and Water Engineering ... 23

KIRKHAM, HULETT & CHANDLER'S



"STANDARD"

WASHER & SCRUBBER.

GEO. SHEPARD PAGE, 49 WALL STREET, N. Y.,

AGENT FOR THE UNITED STATES AND CANADA.

REMOVES ALL AMMONIA and 30 per ct. of SULPHURETTED HYDROGEN & CARBONIC ACID

Yields 10 to 13-oz. liquor. Pressure absorbed, less than half an inch. Adopted by over 100 companies in Europe, and at Newport, R. I., and Quebec, Ca. For circulars, with full particulars, address as above.

THE PROCESS FOR REMOVING THE

Carbonaceous Incrustations

FROM

THE INTERIOR SURFACE OF CLAY RETORTS.

PATENTED BY THE LATE GEORGE W. EDGE.

The subscriber, having secured the title to the *above patent*, is prepared to negotiate with gas companies for its use on very reasonable terms. The great economy of this process has been thoroughly demonstrated in this country and in England, and is the only method so far discovered that removes this troublesome accumulation expeditiously and without injury to the retorts. Address

D. D. FLEMMING, Jersey City Gas Works,
JERSEY CITY, N. J.

MORRIS, TASKER & CO.,

Limited,

Builders of Gas Works,

PHILADELPHIA, PA.

WANTED,

ENGAGEMENT WITH SOME GAS COMPANY,

BY AN ENGINEER OF LARGE EXPERIENCE,

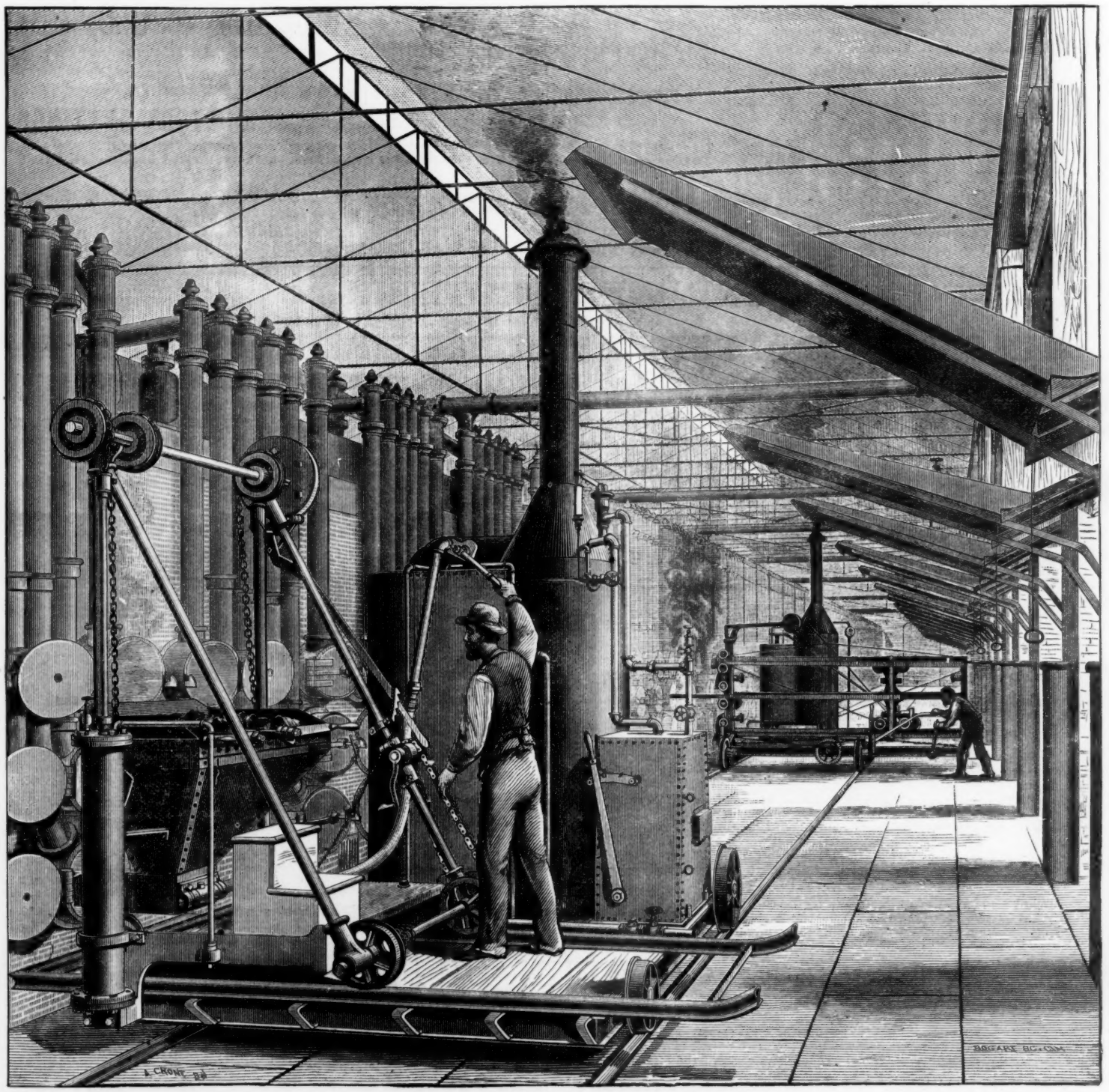
Both in office work and management of the works, Has had experience in chemical laboratory, and believes he has a thorough knowledge of the business of gas making. Would prefer an engagement in Middle or Western States.

517-1t Address "E," Office this Journal.

A. Q. ROSS'

STEAM STOKERS.

Now in continuous and systematic operation at the works of the Cincinnati Gas Light and Coke Company, Cincinnati, Ohio, where for the past sixteen months they have been drawing and charging retorts at the rate of one every minute. Simple in construction, and easily operated by any intelligent man.



Address, A. Q. ROSS, Manager,

U. S. STEAM STOKING COMPANY, CINCINNATI, OHIO, U. S. A.

J. H. CAUTIER & CO.,
CORNER OF
GREENE AND ESSEX STREETS,
JERSEY CITY, N. J.
MANUFACTURERS OF
Clay Gas Retorts,
Gas House Tiles,
Fire Bricks, Etc. Etc.
Ground Clay, Fire Brick and Fire Sand in Barrels,
J. H. GAUTIER.
C. E. GREGORY
393-1y

BROOKLYN
Clay Retort & Fire Brick Works,
(EDWARD D. WHITE & CO.)
Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.
VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.
Office, 88 Van Dyke St., Brooklyn, N. Y.

LACLEDE
FIRE BRICKS AND
GAS RETORT WORKS
CHELTENHAM, MO.
Hand and Machine made Retorts and Settings, Superior Fire Bricks for Siemans Gas and Glass Furnace. Bricks and Tiles for Whitwell's Hot Blast Ovens, Blast Furnace and Cupola Tiles, Etc.
Fire Bricks and Tiles
of all shapes and sizes.
Glass Pot Clay. Fine Ground Clay and Fire Bricks. Sewer Pipe, Etc.
901 Pine Street, St. Louis, Mo.
642—

ESTABLISHED IN 1845.
B. KREISCHER & SONS,
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
Gas Retorts,
TILES, FIRE BRICK.
AND EVERYTHING IN THE FIRE CLAY LINE.

MANHATTAN
FIRE BRICK & ENAMELLED CLAY
RETORT WORKS.
ADAM WEBER.
CLAY GAS RETORTS
AND RETORT SETTINGS,
FIRE BRICKS, TILES, ETC.,
Office and Works, 15th Street and Avenue C., N. Y.

Borgner & O'Brien,
MANUFACTURERS OF
CLAY GAS RETORTS
AND RETORT SETTINGS,
FIRE BRICKS, TILES, ETC.
23d St., Above Race,
PHILADELPHIA.
TWENTY YEARS' PRACTICAL EXPERIENCE.

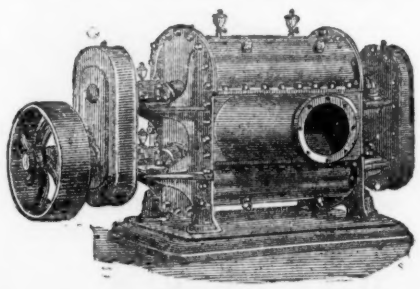
Works, LOCKPORT, PA.
GARDNER BROTHERS,
—ESTABLISHED 1864.—
Works, MT. SAVAGE JUNCTION, MD.
CLAY GAS RETORTS, RETORT SETTINGS, FIRE BRICK, TILES, Etc.
MINERS & SHIPPERS OF FIRE CLAY.
OFFICE, 116 SMITHFIELD ST., PITTSBURGH, PA.
C. H. SPRAGUE, No. 13 EXCHANGE PLACE, BOSTON, MASS., Agent for the New England States.

OFFICE, 418 to 422 East 23d St., New York. ESTABLISHED 1856. WORKS, PERTH AMBOY, NEW JERSEY.
HENRY MAURER,
Excelsior Fire Brick & Clay Retort Works
CLAY GAS RETORTS, BENCH SETTINGS, FIRE BRICK, TILES, ETC.

THE
ECONOMY OF GAS AS A FUEL
FOR
COOKING PURPOSES.

This is a small Pamphlet containing the Paper read by
MR. WILLIAM W. GOODWIN, OF PHILADELPHIA, PA.,
At the recent meeting of the American Gas Light Association.
IT IS INTENDED FOR GRATUITOUS DISTRIBUTION BY GAS COMPANIES AMONG THEIR CONSUMERS
Price, Twelve Dollars per Thousand.
A. M. CALLENDER & CO., No. 42 Pine Street, New York.

P. H. & F. M. Roots'



IMPROVED GAS EXHAUSTER

With Engine on same Bed Plate, or without.

BYE-PASSES, GAS VALVES, GOVERNORS, ELBOWS, PIPE-FITTINGS, &C., FURNISHED TO ORDER.

P. H. & F. M. ROOTS, } Patentees and Manufacturers, {CONNERSVILLE, IND.

S. S. TOWNSEND, General Agent, 6 Cortland St. and 8 Dey St., N. Y.
JAS. BEGGS & CO., Selling Agents, 8 Dey St., N. Y.
WM. COOKE, Selling Agent, 6 Cortland St., N. Y.

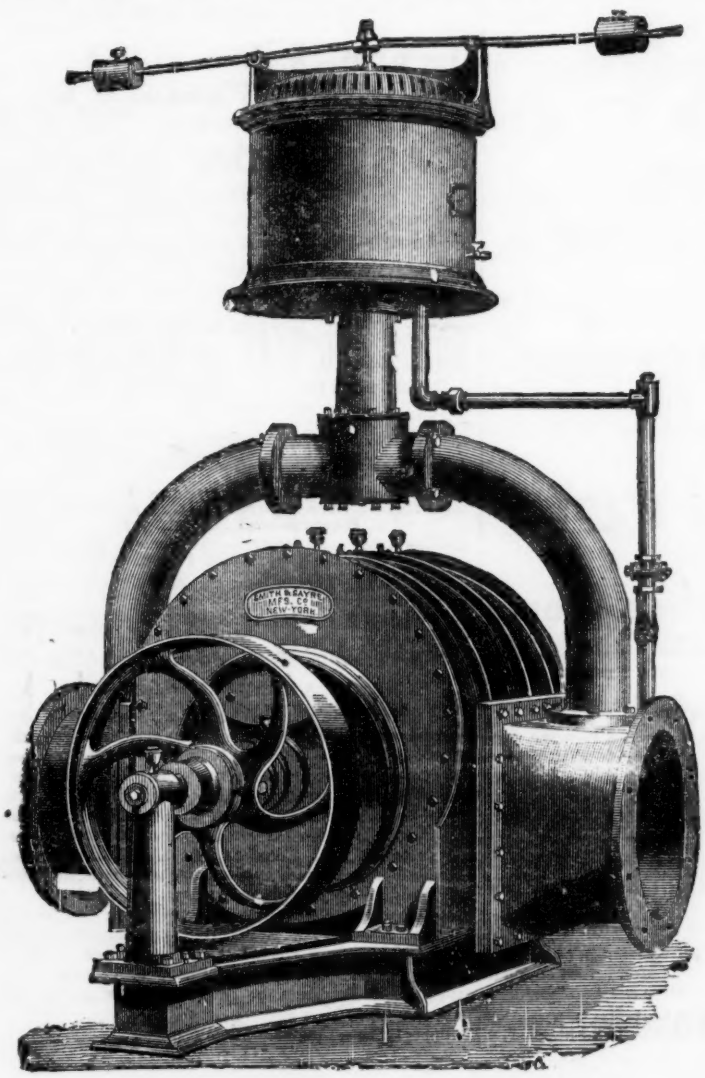
Send for Illustrated Catalogue and Price List.

SMITH & SAYRE MANUFACTURING COMPANY.

Coal and Iron Exchange, 21 Cortlandt Street, N. Y

BUILDERS OF

Machinery and Apparatus for Gas Works.



MACKENZIE'S PATENT ROTARY AND STEAM JET GAS EXHAUSTERS, GOVERNORS, COMPENSATORS, BY-PASSES, CONDENSERS, WASHERS, SCRUBBERS.

ISBELL'S PAT. AUTOMATIC STREET PRESSURE GOVERNOR.

HIGH SERVICE GOVERNOR, GAS AND WATER VALVES, HYDRAULIC MAIN DIP REGULATOR, BENCH CASTINGS, Etc. PURIFYING BOXES, TOWER SCRUBBERS, WITH AUTOMATIC WATER DISTRIBUTOR. *ISBELL'S PATENT SELF-SEALING RETORT DOORS.*

Plans and Estimates for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.

G. G. PORTER, *President* CHARLES W. ISBELL, *Secretary.*

MITCHELL, VANCE & CO.

Manufacturers of

CHANDELIERS

And Every Description of

GAS FIXTURES,

Also Manufacturers of

Fine Gilt Bronze and Marble Clocks, warranted keepers Mantle Ornaments, &c.

Salesroom, 836 BROADWAY.

NEW YO

Special designs furnished for Gas Fixtures for Chur Public Halls, Lodges, &c.

LUDLOW

Valve Manf'g Co.,

OFFICE AND WORKS

938 to 954 River Street and 67 to 83 Vail Ave

TROY, NEW YORK.

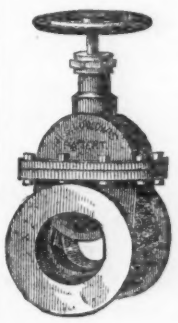
BRASS AND IRON SLIDE VALVES

(Double and Single Gate ¾ inc to 36 inch—outside a inside screw Indicator etc fo Gas Wate and Steam-

HYDRAULIC MAIN DIP REGULATORS.

ALSO

FIRE HYDRANTS.



REFERENCES FURNISHED.

SEND FOR CIRCULARS.

Portland Cement,
Roman Cement,
Keene's Cement,
Sellars Gas Cement.

English Fire Brick, No. 1.
" Silica Fire Brick.

IMPORTER

S. L. MERCHANT

41 Broadway, New York,
Just below Trinity Church. 344-1y

☞ Remit 25 cents postage for "Practico Treatise on Cement.

F. O. NORTON,

MANUFACTURER OF

Hydraulic Cement,

Specially adapted for gas works. Under water it is capab of giving better results than Portland or any other cement

21 Cortland Street, New York.

Preserve the Journal!

We will furnish to our subscribers an important article for *preserving in a convenient form*, the numbers of the Journal as it is issued at the very low price of $1.25. Sent either by Express or Mail, as directed.

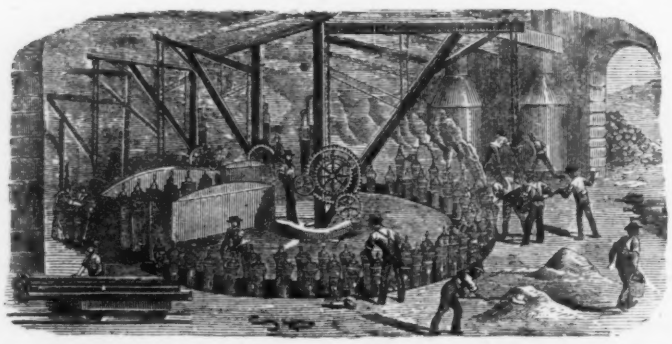
By mail the postage will be 20 cents, which will be added to the price of the Binder. Send orders to

A. M. CALLENDER & CO.
42 Pine Street, Room 18, New York.

A. H. M'NEAL & BRO.,

BURLINGTON. N. J,

Flange-Pipes



General Foundry Work.

CAST IRON PIPES

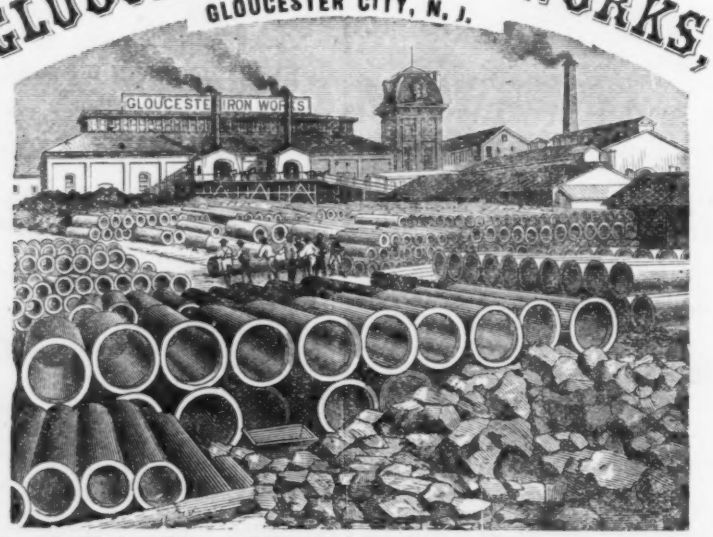
FOR WATER AND GAS.

DAVID S. BROWN, Pres.
BENJAMIN CHEW, Treas

JAS. P. MICHAELSON, Sec.
WM. SEXTON, Supt.

GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.



Cast Iron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gasholders. &c.

Office No. 6 North Seventh Street, Philadelphia.

ESTABLISHED 1856.

WARREN FOUNDRY AND MACHINE CO.,

WORKS AT PHILLIPSBURGH, N. J.
NEW YORK OFFICE, 153 BROADWAY.

Cast Iron Water and Gas Pipe

FROM TWO TO FORTY-EIGHT INCHES DIAMETER.
ALSO ALL SIZES OF

FLANGE PIPE for Sugar House and Mine Work.

Branches, Bends, Retorts, Etc., Etc.

436-1

SCIENTIFIC BOOKS.

We are prepared to furnish to GAS MANAGERS and others interested in the topics treated of, the following Books, at prices named :

GAS MANUFACTURE, by WILLIAM RICHARDS, 4 to, with numerous Engravings and Plates, in Cloth binding. $12.

THE GAS ANALYST'S MANUAL, by F. W HARTLEY. $2.50.

ANALYSIS, TECHNICAL VALUATION, PURIFICATION and USE OF COAL GAS, by Rev. W. R. BOWDITCH, M. A., with ngravings. 8 vo Cloth. $4.50.

NEWBIGGINS HAND BOOK. by THOMAS NEWBIGGIN, C. E. $3.75

GAS CONSUMERS HAND BOOK, by WM. RICHARDS. C. E. 18 mo. Sewed. 20 Cents.

GAS CONSUMERS MANUAL, by E. S. CATHELS, C.E. 10 Cents.

PRACTICAL TREATISE ON HEAT, by THOMAS BOX. Second edition. $5.

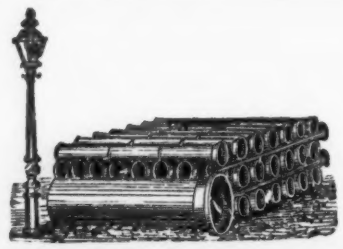
AIR AS FUEL, OR PETROLEUM AND OTHER MINERAL OILS UTILIZED BY CARBURETTING AIR, by OWEN C. D. ROSS, Member Institute Civil Engineers. 8 vo. Cloth. $1.50.

FODELL'S SYSTEM OF BOOKKEEPING FOR GAS COMPANIES. $5.

The above will be forwarded by Express. upon receipt of price.

We will take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances must be made by Check, Draft, or Post Office Money Order.

A. M, CALLENDER & CO.,
Room 10, No. 42 Pine St., N. Y.



R. D. WOOD & CO.,

PHILADELPHIA.

MANUFACTURERS OF

CAST IRON PIPE

FOR GAS AND WATER

Lamp Posts, Valves, Etc.

Mathew's Pat. Anti-Freezing Hydrants,

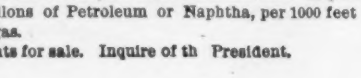
400 Chestnut Street.

JAMES MARSHALL & CO.

Franklin Foundry and Pipe Works,

MANUFACTURERS OF

GAS, WATER, AND OIL PIPES



Works, 18th, 19th, 20th and Railroad Stree
Office, No. 23 Nineteenth Street.

Pittsburgh, Pa.

N.B.—Pipes from 3-inch and upwards cast in 12 ft. lengths.
☞ Send for Circular and Price List.

BERGEN IRON WORKS.

ROBT. CAMPBELL & CO.

MANUFACTURERS OF

CAST IRON PIPES,

FOR WATER AND GAS,

Valves, Fire and Dock Hydrants,
Lamp-Posts and Flange Work,
Bench Castings for Gas Works, &c.

Office, 85 Liberty Street, N. Y.

Mellert Foundry & Machine Co.,

Limited. Established 1848.

MANUFACTURERS OF

With Special Castings, Flange Pipe, Water Gates, Fire Hydrants, Lamp Posts, Retorts and Machinery,

And Castings of every description for Furnaces, Rolling Mills, Grist and Saw Mills, Mining Pumps, Hoists, etc.

ARNOLD MELLERT, Supt., READING, PA.

NATIONAL COAL GAS COMPANY.

320 Broadway, N. Y., Rooms 50, 51 & 52.

H. P. ALLEN, President.

The process known as GWYNNE-HARRIS but from later most essential improvements, more appropriately called the ALLEN-HARRIS, or AMERICAN HYDROCARBON process for making "Water Gas," by the decomposition of superheated steam, in fire-clay retorts, set similarly to those in Coal Gas Works, is an established success. More than One Hundred Million cubic feet of gas have been made under this process, and for *permanency* and *brilliancy*, as well as economy both to the manufacturer and consumer, it is superior to any gas made by the old, or any other method.

Our process is *not intermittent* but continuous. The steam and the oil are admitted into the retorts by gauge cocks, and run for days without change. All the materials required, besides the steam, are 17 lbs. of Anthracite coal and about 3¼ gallons of Petroleum or Naphtha, per 1000 feet of brilliant gas.

Rights for sale. Inquire of th President.

The Kerr Murray Mfg. Co.,

THE LATEST IMPROVED

Gas Apparatus

AND

MACHINERY,

Wrought Iron Roofs and Bench Castings,

SINGLE LIFT AND TELESCOPIC GASHOLDERS.

FORT WAYNE, IND.

BARTLETT, HAYWARD & CO.,

ARCHITECTURAL IRON WORKS.

MANUFACTURERS OF

GAS HOLDERS, BENCH CASTINGS, MULTITUBULAR WATER AND AIR CONDENSERS, COMMON AND TOWER SCRUBBERS, ROTARY & STEAM JET EXHAUSTERS, WROUGHT IRON ROOF FRAMES.

MANUFACTURERS OF ALL DESCRIPTIONS OF GAS APPARATUS.

WORKS:

Cors. Pratt, Scott, McHenry, Ramsay and Bartlett Streets.

BALTIMORE, MARYLAND.

Plans, Specifications, and Estimates furnished. Correspondence solicited. 467-1y

---

CONNELLY & CO.,

SOLE MANUFACTURERS OF

Iron Sponge Purifying Material

AND

CONNELLY'S JET EXHAUSTERS.

407 Broadway, New York City.

C. GEFRORER.

Manufacturer of

GAS BURNERS,

GAS HEATING AND COOKING APPARATUS.

FITTERS' PROVING APPARATUS, ETC.

No. 248 North Eighth Street, Philadelphia.

1842. DEILY & FOWLER 1880.

LAUREL IRON WORKS.

ADDRESS, 39 LAUREL STREET,

PHILADELPHIA.

MANUFACTURERS OF

GAS HOLDERS,

SINGLE AND TELESCOPIC—WITH CAST OR WROUGHT IRON GUIDE FRAMES.

We are prepared to furnish Holders, Wrought Iron Roof Frames, Bench Castings, Condensers, Scrubbers, Purifiers, Drips, Bends, Tees, and all other Iron Work connected with Gas Works. We have built 12 gas works and 122 gasholders. Personal supervision given to the erection of all our work. Holders built at following places since 1868:

Lancaster, Pa. (2)
Williamsport, Pa. (3)
Bristol, Pa. (2)
Catasaqua, Pa.
Kittanning, Pa.
Hazelton, Pa.
Freeport. Pa.
Huntingdon, Pa.
Pittston Pa.
Bethlehem (S). Pa.
Sharon, Pa.
Canton, Pa.
Carlisle, Pa.
Beaver Falls, Pa.
Annapolis, Md. (2)
Parkersburg, W. Va.
Lynchburg, Va.
Stanton, Va.
Youngstown, O
Steubenville, O.
Zanesville, O.
Mansfield, O.
Marion, O.
Bellcaire, O.
Athens. O.
Barnesville, O.
Newark, O.
Columbus, O.
Franklin, Ind.
Indianapolis, Ind.
Jacksonville, Ill.
Joliet, Ill.
Lawrence, Kansas.
Jefferson City, N. O. La. (2)
Algiers, N. O., La.
Kalamazoo, Mich
Buffalo, N. Y. (2)
Ogdensburg, N. Y.
Waverly, N. Y.
Little Falls, N. Y.
Penn Yann, N. Y.
Watkins, N. Y.
Coney Island, N. Y.
Batavia, N. Y.
Gloucester, N. J.
Salem, N. J.
Mount Holly, N. J.
Plainfield, N. J.
Englewood, N. J.
Flemington, N. J. (2)
Dover, Del.
Pittsfield, Mass.
Meriden, Conn.
Milwaukee, Wis.
Burlington, Vt.
Hoosick Falls, N. Y.
Attica, N. Y.

BROWN & OWEN,

MANUFACTURERS OF

EVERY DESCRIPTION OF

Gas and Water Works Supplies.

Particular attention given to the alteration of old works. Estimates and Drawings furnished.

THOS. R. BROWN, R. PITT OWEN.
Late Chief-Eng. Phila. Gas Works.

Address all communications to

N. W. Cor. 12th and Noble Streets,

482-1y **PHILADELPHIA.**

HERRING & FLOYD,

Oregon Iron Foundry

738, 740, 742 and 744 Greenwich St., N. Y

MANUFACTURERS OF

ALL KINDS OF CASTINGS

AND

APPARATUS FOR GAS-WORKS.

BENCH CASTINGS
from benches of one to six Retorts each.
WASHERS: MULTITUBLAR AND AIR CONDENSERS CONDENSERS; SCRUBBERS,
(wet and dry), and
EXHAUSTERS
for relieving Retorts from pressure.
BENDS and BRANCHES
of all sizes and description.

FLOYD'S PATENT
MALLEABLE RETORT LID.
BUTLER'S
COKE SCREENING SHOVELS.

SABBATON'S PATENT
FURNACE DOOR AND FRAME.

SELLER'S CEMENT
for stopping leaks in Retorts.

GAS GOVERNORS,
and everything connected with well regulated Gas Works low price, and in complete order.

N. B.—**STOP VALVES** from three to thirty inches—at very low prices.

SILAS C. HERRING. JAMES R. FLOYD

H. RANSHAW, Pres. & Mangr. T. H. BIRCH, Asst. Mangr.
WM. STACEY, Vice-Pres. R. J. TARVIN, Sec. & Treas

STACEY MANUFACTURING CO.,

MANUFACTURERS OF SINGLE AND TELESCOPIC

GAS-HOLDERS

AND ALL KINDS OF

Cast and Wrought Iron Work

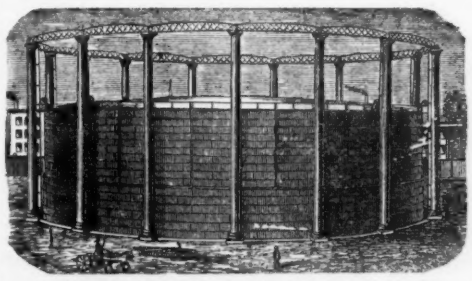
Used in the Erection of Gas and Coal Oil Works.

Foundry on MILL STREET; Nos. 33, 35, 37 and 39
Office and Wrought Iron Works on RAMSAY STREET Cincinnati, Ohio.

REFERENCE.

Cincinnati Gas-Light Co.
Indianapolis Gas Co.
Dayton, O., Gaslight Co.
Covington, Ky., Gas Co.
Springfield, O., Gas Co.
Terre Haute, Ind., Gas Co.
Madison, Ind., Gas Co.
Kansas City, Mo., Gas Co.
Topeka, Kansas, Gas Co.
Burlington, Iowa, Gas Co.
Nashville, Tenn., Gas Co.
Baton Rouge, La., Gas Co.
Saginaw, Mich., Gas Co.
Oshkosh, Wis., Gas Co.
Peoria, Ill., Gas Co.
Quincy, Ill., Gas Co.
Champaign, Ills., Gas Co.
Carlinville, Ill., Gas Co.
Bowling Green, Ky., Gas Co.
Hamilton, Ohio, Gas Co.
Vicksburg, Miss., Gas Co
Denver City, Col., Gas Co.
R. T. Coverdale, Eng'r Cincinnati, and others.

CONTINENTAL WORKS.



GASHOLDERS OF ANY MAGNITUDE.

T. F. ROWLAND, Proprietor,

GREENPOINT, BROOKLYN, N. Y

ENGINEER AND MANUFACTURER OF

GAS-HOLDERS,

CONDENSERS, SCRUBBERS, VALVES, PURIFIERS, RETORTS, and HYDRAULIC MAINS,

and all other articles connected with the Manufacture and Distribution of Gas. Plans and Specifications prepared and Proposals given for the necessary Plans for Lighting Cities. Towns, Mansions, and Manufactories.

P. MUNZINGER,

Engineer and Builder,

No. 1211 MARKET STREET, PHILADELPHIA, PENN.

BUILDER AND CONSTRUCTOR OF ALL KINDS OF GAS MACHINERY,

ON THE LATEST AND MOST IMPROVED PLAN.

Bench Castings, Condensers, Scrubbers, Purifiers, Centre Valves, Gasholders, Stop Valves, Etc., Etc.

Estimates and Drawings Furnished upon Application.

GAS COALS. GAS COALS. GAS COALS.

"SCOTT'S" OCEAN MINE

YOUGHIOGHENY GAS COAL.

W. L. SCOTT & CO., Proprietors, ERIE, PA.

This Colliery is located at Scott Haven, on the Youghiogheny River, Westmoreland County, Pa., directly adjoining the Penn Company's Youghiogheny Mine.

Over One Hundred and Fifty Thousand Tons of this Coal Sold in 1880

for delivery during the year ending March, 1881, distributed among forty different Gas Company's, including *every Company in New York City, Brooklyn, Jersey City, and Newark*, nearly every Company on the Hudson River as far as Albany and Troy, as well as all the prominent Companies on the Sound—at Boston and other New England ports.

The universal favor with which this coal has been received has induced Messrs. Scott & Co. to increase their already large facilities for meeting the wants of Gas Companies, giving to consumers an undoubted guarantee that delivery will be promptly made. Applications addressed to the undersigned will meet with prompt response.

PERKINS & CO., General Sales Agents,

41 SOUTH STREET, N. Y.

The West Fairmont and Marion Consolidated Coal Company,

Mines at Fairmont, West Virginia,

OFFER FOR SALE THEIR

VERY SUPERIOR GAS COAL,

IN ANY QUANTITY DESIRED, on the shortest notice, at their office, 231 BROADWAY, New York

JOURNAL des USINES a GAZ.

Issued on the 5th of each Month.

THIS JOURNAL CONTAINS ALL THE LATEST SCIENTIFIC AND PRACTICAL INFORMATION RELATING TO GAS MANUFACTURE IN FRANCE.

MESSRS. SERVIER, MONNIER, AND ROUGET, EDITORS AND MANAGERS.

Subscriptions Received at this Office. Price, Post-paid, $3.50 Per Annum.

THE GAS ANALYST'S MANUAL.

BY F. W. HARTLEY, A.I.C.E., M.S.E. E. & F. N. SPON, PUBLISHERS.

PRICE, $2.50.

CONTENTS. SECTION I.—The purposes of photometry. Standard light. Standard burner. Gas Works Clauses Act Amendment Act, 1871:—Regulations in respect of testing apparatus, mode of testing for illuminating power, and for sulphuretted hydrogen. Description of standard apparatus. The photometer room. Preparation of candles. Testing operations. Readings. Correction for gas consumpt. Corrections for candles' consumpt. Corrections for barometric pressure and temperature. Ordinary photometers. The inferential or jet photometers. To set the jet photometer at work. To rate the jet photometer.

SECTION II.—Duration and mode of testing in London, sulphuretted hydrogen, ammonia, sulphu compounds. Preparation of solutions. Fitting up. To set the apparatus at work. Analysis.

SECTION III.—Ammonia. Sulphuretted hydrogen. Carbonic acid. The Cooper's Tube, or Eudiometer. To calculate weight of sulphur. Harcourt's color test. A rapid and accurate methodof estimating sulphur in coal gas. Specific gravity. To find the specific gravity of dry gas. To correct the bulk and find the weight of gas.

APPENDIX.—Rules and tables to facilitate the calculations necessary in the determination of the illuminating value and degree of purity of coal gas. Photometry. Ammonia and sulphur. Proving of testing meters in London. The gas referees' cubic-foot measure. Times and mode of testing for pressure in London. Proposed standards of light.

A. M. Callender & Co., 42 Pine Street, N. Y.

KING'S TREATISE ON COAL GAS.

Vol. I., Bound in Cloth, $10.

A. M. CALLENDER & CO., 42 Pine Street, N. Y.

THE AMERICAN GAS-LIGHT JOURNAL.

$3 PER ANNUM.

42 Pine Street, N. Y.

TYRCONNELL GAS COAL.,

MINED IN TAYLOR COUNTY, WEST VA.

Company's Office, 25 S. Gay St., Baltimore.

CHARLES MACKALL, Secretary.

CHARLES W. HAYS, Agent, Room 7, 111 B'way, N. Y.

SHIPPING POINT—Baltimore, Md.

This coal yields 10,000 cubic feet of Gas with an illuminating power of over 16 candles. Forty bushels of very superio Coke, with little Ash and scarcely any clinker 04-1y

G. W. DRESSER, C.E.,

Member American Society Civil Engineers.

CONSULTING ENGINEER

ON ALL MATTERS PERTAINING TO

Gas Manufacture

AND THE UTILIZATION OF

RESIDUAL PRODUCTS.

"How to Burn Gas."

Under this title a neat little book has been issued containing the paper of Mr. Jas. Somerville, as read at the last meeting at Cincinnati, together with a table, taken from Prof. Chandler's lecture, showing the loss of light resulting from the use of shades, etc., of different kinds of glass.

The book is intended for sale to Gas Companies to distribute gratuitously among consumers. If Gas Companies can induce their consumers to use better burners and shades, one-half of the fault-finding will cease.

The price is $10 per thousand. Orders may be sent to the office of this Journal.

GAS COALS. GAS COALS. GAS COALS,

NEW YORK AND CLEVELAND
GAS COAL COM'Y
Of Pittsburgh, Pa.

MINERS AND SHIPPERS OF

YOUGHIOGHENY GAS COAL.

This Company is prepared to furnish any amount of their justly celebrated, and acknowledged superior GAS COAL, to any point reached by railroad or navigation. on most favorable terms.

General Office—89 Wood Street,
PITTSBURGH, PA.

Branch Office—120 Water Street,
CLEVELAND, OHIO.

WILLIAM A. McINTOSH, President.
A. CARNEGIE, Vice-President.
W. P. DE ARMIT, Treasurer.
THOMAS AXWORTHY. Agent
351-1y at Cleveland, Ohio.

THE NEWBURGH

Orrel Coal Company,

Mines at Newburg, Preston County, W. Va.
Company's Office, No. 52 S. Gay Street, Baltimore, Md.
C. OLIVER O'DONNELL, Pres't. CHAS. MACKALL, Sec'y.
CHAS. W. HAYS, Agent in New York, Room 7, Trinity Building, 111 Broadway.

This Company offer their very superior Gas Coal at lowest market prices.

It yields 10,996 cubic feet of gas to the ton of 2,240 lbs. of good illuminating power, and of remarkable purity; one bushel of lime purifying 6,792 cubic feet, with a large amount of coke of good quality.

It has been for many years very extensively used by various Gas Companies in the United States, and we beg to refer to the Manhattan, Metropolitan, and New York Gas Light Companies of New York; the Brooklyn and Citizen's Gas Light Companies of Brooklyn, N. Y.; the Baltimore Gas Light Company of Baltimore, Md., and the Providence Gas Light Company, Providence, R. I.

Best dry coals shipped from Locust Point, wharves, and prompt attention given to orders for chartering of vessels.
294-1y.n

THE DESPARD COAL COMPANY

OFFER THEIR SUPERIOR

DESPARD COAL

To Gas Light Companies throughout the country.
Agents, PARMELEE BROTHERS, No. 32 Pine street, N. Y.
BANGS & HORTON, No. 31 Duane street, Boston.
Mines in Harrison County, West Virginia.
Wharves Locust Point, } Baltimore.
Company's Office, 15 German St., }

Among the consumers of Despard Coal, we name: Manhattan Gas Light Company, New York; Metropolitan Gas Light Company, New York; Jersey City Gas Light Company, N. J.; Washington Gas Light Company; Portland Gas Light Company, Maine

. Reference to them is requested. 204-1

THE

PENN GAS COAL COMPANY

OFFER THEIR

COAL, CAREFULLY SCREENED,

AND PREPARED FOR

GAS PURPOSES.

Their Property is located in the Youghiogheny Coal Basin, near Irwin's and Penn Station on the Pennsylvania Railroad, and on the Youghiogheny River.

OFFICES

No. 209 South Third Street, Phil'a. 90 Wall Street, New York.

PLACES OF SHIPMENT.

Pennsylvania Railroad, Pier No. 2 (Lower Side).
Greenwich Wharves, Delaware River.
366-1y **Pier No. 1 (Lower Side), South Amboy, N. J.**

CANNELTON COAL COMPANY

Miners of the celebrated **CANNELTON CANNEL,** acknowledged to be the *best enricher* produced in this country, yielding 10,000 cubic feet of 64.54 candle gas per ton of 2,240 pounds.

J. TATNALL LEA, Treasurer, P. O. Box 1747 Philadelphia.

SALES AGENTS: **PERKINS & CO.,** New York. **DANIEL W. JOB & CO.,** Boston. **MAYER, CARROLL & CO.,** Baltimore

---

FORT PITT GAS COAL

THE FORT PITT COAL CO.

OFFER THEIR CELEBRATED

Fort Pitt Gas Coal,

Carefully Screened and Prepared for Gas Purposes, Delivered at any Point reached by Railroad or Navigation, on the Most Favorable Terms.

Office, No. 337 Liberty Street,

PITTSBURGH, PENN.

Box 314. J. E. McCRICKART, Manager.

THE MONTAUK GAS COAL COMPANY

JOHN WHITE, President,

Smith Building, 3, 5, & 7 Cortlandt St., N. Y.

WHARVES, LOCUST POINT, BALTIMORE, MD.

JAMES BOYCE, Agent and Shipper, BALTIMORE.

English and Provincial Gas Coals,

IMPORTED BY THE UNDERSIGNED, VIZ.:

BLOCK HOUSE, GLACE BAY, AND INTERNATIONAL,

FROM THE BRITISH PROVINCES.

Abram Company's Arley Gas Coal and Cannel,
Higginson's North Ince Hall Gas Cannel,

FROM LIVERPOOL. DELIVERED AT ANY PORT IN THE UNITED STATES.

ANALYSES FURNISHED AND FULL PARTICULARS OBTAINED BY APPLYING TO

PERKINS & CO., 41 South Street, New York.

INTERNATIONAL--1876--EXHIBITION.

The U. S. Centennial Commission

HAVE DECREED AN AWARD TO

HARRIS, GRIFFIN & CO.,

12th and Brown Sts., Philadelphia, and 49 Dey St., N. Y., U. S, A.,

FOR THE FOLLOWING REASONS:

The Exhibit consists of a Series of METERS from the Largest Size Station Meters for the use of the MANUFACTURE OF GAS, to those for the use of the ORDINARY CONSUMER. The Instruments are WELL MADE, RELIABLE as to INDICATION, and embody a number of sundry improvements which, with the general character of the Exhibit, entitle the whole to commendation.

Attest—J. L. CAMPBELL, Secretary, pro-tem. Signed—A. T. GOSHORN, Director General J. R. HAWLEY, President.

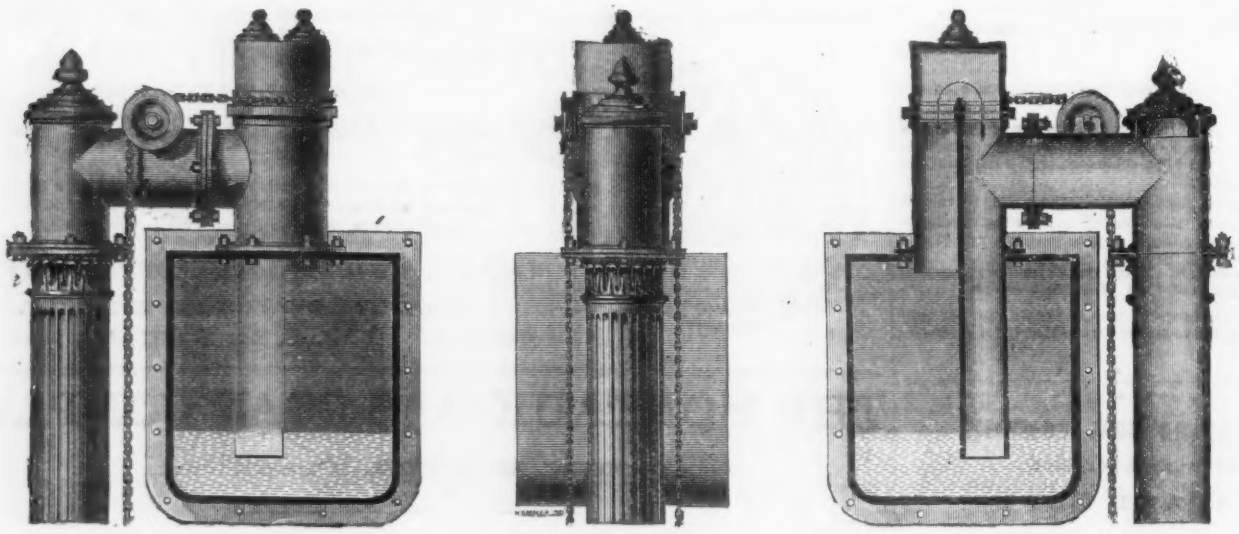
GROUP JUDGES.

AMERICAN.

PROF. JOSEPH HENRY, LL.D., Secretary of Smithsonian Institution, Washington, D. C.
PROF. F. A. P. BARNARD, S.T.D., LL.D., President of Columbia College, N. Y.
PROF. J. E. HILGARD, Washington, D. C.
PROF. J. C. WATSON, Ann Arbor, Michigan.
GENERAL HENRY K. OLIVER, Salem, Massachusetts.
GEORGE F. BRISTOW, New York.

FOREIGN.

SIR WILLIAM THOMSON, LL.D., D.C.L., F.R.S., Great Britain
JUL. SCHIEDMAYER, Germany.
MR. E. LEVASSEUR, France.
P. F. KUPKA, Austria.
EDW. FAVRE PERRET, Switzerland.



FARMER'S PATENT BYE-PASS DIP-PIPE.

WILLIAM FARMER,

ARCHITECT AND GENERAL GAS ENGINEER,

ROOMS 87, 89, 91, 111 BROADWAY, NEW YORK.

WILLIAM FARMER may be consulted upon all matters relating to the Manufacture of Illuminating Gas. Will furnish Specifications, Drawings, and Estimates for the Erection of Gas Works of any Capacity, and will erect the same either on Commission or by Contract.
Having made the Construction of Gas Works a Specialty, perfect satisfaction can be guaranteed.
Sole Agent for the FOULIS HYDRAULIC MACHINE for Drawing and Charging Retorts.
Sole Agent for the AITKEN and YOUNG PROCESS FOR MAKING ILLUMINATING GAS.

PATENTEE OF THE FOLLOWING INVENTIONS.

EXHAUSTER (Screw Propeller) for Gas or Air, and Condensation. DUMPING BARROW for Wheeling Coal, Coke and Lime, Etc. HYDRAULIC MAIN for Reducing Pressure on Retorts. ZIGZAG SCRUBBERS for Naphthalizing the Gas and Removing the Tar, Ammonia, and Naphthaline. BYE-PASS DIP PIPE for reducing the Pressure on Retorts, Etc., as per cut above. SELF-ACTING WATER DISTRIBUTOR for Scrubbers and Washers, Etc. MOVABLE DIP PIPE for Reducing and Equalizing the Pressure on Retorts. TOWER SCRUBBERS (Jacketed) for Economizing Space and Building Material. DUPLEX CENTRE SEAL for Keeping all the Boxes in a set continuously in action.

REFERS BY PERMISSION TO THE FOLLOWING GENTLEMEN.

Professor B. SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
GEN. A. RICKENLOOPER, President Cincinnati Gas-Light Co., Cincinnati, Ohio.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
D. HOSTETTER, President Pittsburgh Gas-Light Co., Pittsburgh, Pa.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
E. VANDERPOOL, Engineer, Newark Gas-Light Company, Newark, N. J.

T. C. HOPPER, Prest. and Gen. Supt. WM. H. HOPPER, Vice-Prest. WM. N. MILSTED, Treas. WM. H. DOWN, Sec.

AMERICAN METER COMPANY,

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTRE VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR AND JET PHOTOMETERS.

Manufactories:
512 W. 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES—AMERICAN, FRENCH, & ENGLISH.
SUGG'S ILLUMINATING POWER METER.
SUGG'S "STANDARD" ARGAND BURNERS. ALSO NN AND TTT.
Wet Meters, with Lizar's "Invariable Measuring" Drum.
Sole Agents for Wm. Cowan's Automatic Pressure Changer.

Agencies:
37 Water Street, Cincinnati.
20 South Canal Street, Chicago.
810 North Second Street, St. Louis.
122 & 124 Sutter St., San Francisco.

HELME & McILHENNY,

Successors to Harris & Brother.

ESTABLISHED 1848.

PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.,

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 33 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

WILLIAM HELME. JOHN McILHENNY.

WM. WALLACE GOODWIN, Prest. and Treas. WM. H. MERRICK, V.-Prest. H. DUMONT WAGNER, Supt. S. L. JONES, Sec. S. V. MERRICK, Asst. Sec.

THE GOODWIN GAS STOVE AND METER COMPANY,

Successors to W. W. GOODWIN & CO.

No. 1012, 1014 and 1016 Filbert Street, Philadelphia, Pa.

No, 142 Chambers Street, New York

MANUFACTURERS OF GAS STOVES FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Goodwin's Improved Lowe's Jet Photometer.

Special attention to repairs of Meters, and all apparatus connected with the business.
All work guaranteed first class in every particular, and orders filled promptly.

Review of Gas and Water Engineering.

ISSUED EVERY ALTERNATE FRIDAY.

Edited and Published by CHAS. W. HASTINGS, 8 Buckingham St., London, Eng.

Each number contains articles in connection with the manufacture and supply of Gas; summary of latest intelligence on the subject of Electric Lighting; articles upon Water Supply; also on the Construction and Maintenance of Gas, Water, and Sewage Works.

Price, 10s., Postpaid.

The Gas and Water Companies' Directory.

Edited and Published Annually by CHARLES W. HASTINGS.

This Work gives a complete list of all Gas and Water Companies throughout England, Scotland, Ireland and Wales; date of formation, amount of capita and names of all officers, etc.; including carbon returns, prices paid for gas, dividends, etc.

Price, in Cloth Covers, 5s.; Paper Covers, 3s. 6d. Postage Extra.

Address, 8 BUCKINGHAM STREET,
LONDON, W. C., ENGLAND

Orders Received at this Office.

NOW READY AND FOR SALE,

FODELL'S
System of Bookkeeping
FOR GAS COMPANIES.

Price $5, which should be sent either in Check, P. O. Order or Registered Letter.

Blank Books, with printed headings and forms on this system, will be supplied to Gas Companies, by applying to W. P. FODELL Philadelphia, or

A. M. CALLENDER & CO
OFFICE GAS LIGHT JOURNAL, 42 Pine St., N. Y

CATHEL'S
GAS CONSUMERS MANUAL,

Enables every Gas Consumer to ascertain at a glance, without any previous knowledge of the Gas Meter, the quantity and money value of the Gas consumed. Also the best method of obtaining from Gas the largest amount of its light.

It will be to the advantage of Gas Companies to supply their Consumers with one of these Guides, as a means of preventing complaint arising from their want of knowledge in regard to the registration of the meters. For sale by

A. M. CALLENDER & CO.
42 Pine Street, New ork Room 18

NOTICE.

The Goodwin Gas Stove and Meter Company are the Sole Agents for the sale of BRAY'S BURNERS AND LANTERNS in this country. We are now prepared to furnish 100 and 200-candle power Burners and Lanterns. Send for Circulars.

The "Sun Dial" Gas Stove,

—MANUFACTURED BY THE—

GOODWIN GAS STOVE & METER CO.,

Successors to W. W. GOODWIN & CO.,

1012, 1014, 1016, Filbert St., Phila., and 142 Chambers St., N. Y.

Medals Awarded.

CENTENNIAL - - 1876.
CHARLESTON - - - 1879.
CINCINNATI - - 1879.
PHILADELPHIA - - 1879.

TRADE MARK.

ONE GOLD AND THREE SILVER MEDALS BY THE MARYLAND INSTITUTE, AT BALTIMORE - - 1878.

These are the most complete Gas Stoves in the world. Over 50 different sizes and kinds, suitable for any sized family or hotel. The only Gas Stove by which joints and poultry can be roasted as before an open fire. These stoves are constructed especially to meet the requirements of domestic ecomomy. They possess the following advantages:

1. More economical than coal or wood. 2. An open roaster. 3. Freedom from all contact with gas. 4. A well ventilated oven. 5. No confined vapors. 6. A regular diffused heat. 7. A broiler free from smoke. 8. A hot plate fitted with patent air and gas burners, arranged for boiling, stewing, and frying. 9. No coal to bring up, no ashes to empty, no smoke. Only a match required for kindling wood.

GREAT ECONOMY OF GAS.

From Twenty-five per cent. to Forty per cent. of gas saved by the use of our NON-CONDUCTING LINING. Patent applied for.

SMOOTHING IRON HEATERS.

In the laundries of hotels or private dwellings, by hatters, tailors, etc., gas can be used for heating smoothing irons, especially on account of the facility with which they may obtain heat in a few minutes. We manufacturethem for heating one, two, three, four or more irons at once.

WM. W. GOODWIN, Pres. & Treas. H. DUMONT WAGNER, Supt. SAMUEL V. MERRICK, Asst. Sec.
WM. H. MERRICK, Vice-Pres. S. LEWIS JONES, Sec. WM. H. WHITE, Mang. N.Y. Branch.